AUTOPSY DRAWER 15 DEATH

41 2009 085 03410

The Assassination of Abraham Lincoln

Autopsy

Excerpts from newspapers and other sources

From the files of the

Lincoln Financial Foundation Collection

THE REPORT ON LINCOLN'S AUTOPSY.

From The Washinton Post.

One of the assistants to Chief Clerk Sylvester, of the Metropolitan Police Department, is Mr. Harry P. Cattell, who has charge of the property room. In his younger days Mr. Cattell was an emhalmer, and at the time of President Lincoln's assassination he was in the employ of Brown & Alexander, embalmers, who had their establishment on Pennsylvania-ave., near Eleventh-st., Northwest. On Saturday morning, April 15, a few hours after the death of the President, Mr. Cattell was directed by his employers to go to the Executive Mansion and embalm the body. It was 9 o'clock in the morning when he reached there with his instruments and embalming fluid and proceeded to work.

It is nearly thirty years ago since the assassination, which excited profound horror in all civilized portions of the globe, and while every reader knows how the beloved Chief Executive met his death, comparatively few people of this generation know just where the fatal bullet entered his body or what course it took. Mr. Cattell showed a "Post" reporter a verbatim copy of the original autopsy report, written by an assistant to Surgeon-General Barnes, who made the autopsy. The following is an exact copy of it:

"Yesterday Surgeon-General Barnes, assisted by Drs. Stone, the late President's family physician; Curtis, Woodward, Crane, Tafft, and other eminent medical men, made an autopsy in the presence of President Johnson, General Augur and General Rucker. The external appearance of the face of the President presented a deep black stain around both eyes. The fatal wound was on the left side of the head, behind and in a line with and three inches from the left ear. The course of the ball was obliquely forward toward the right eye, crossing the brain in an oblique manner and lodging a few inches behind that eye. In the track of the wound were found fragments of bone, which had been driven forward by the ball, which was embedded in the anterior lobe of the left hemisphere of the brain. The orbit plates of both eyes were the seat of communicated fracture, and the eyes were filled with extravasated blood. The serious injury of the orbit plates was due to the centre-coup, the result of the intense shock of so large a projectile fired so closely to the head. The ball was evidently a Derringer, hand-cast, and from which the neck had been clipped. A shaving of lead had been removed from the ball in its passage through the bones of the skull and was found in the orifice of the wound. The first fragment of bone was found two and one-half inches within the brain; the second and larger fragment about four inches from the orifice of the wound. The ball lay still further in advance. The wound was about one-half inch in diameter. The autopsy fully confirmed the opinion of the surgeons on the night of the assassination that the wound was mortal.

"Yesterday morning Drs. Brown and Alexander were sent for to embalm the body of President Lincoln. The embalming process was performed by Mr. Harry P. Cattell, an employe of the above-mentioned firm, who also embalmed little Willie Lincoln, son of the President, in February, 1862. The body was embalmed in the late President's own bedroom in the west wing of the Executive Mansion, fronting on Pennsylvania-ave. Among those in attendance during the process were Vice-President Johnson, General Augur, General Rucker and the attending physicians of the lamented deceased."

1894?

AUTOPSY ON LINCOLN.

Very Few People Know Where the Fatal Bullet Entered His Body.

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Notes Autopsy

President Lincoln

April 14th/65

Finding

Autopsy notes by Dr. Robert K. Stone, Lincoln's family physician
Autopsist assistant surgeon J Janvier Woodward

Shot 1 inch, left median line traversing left lateral sinus upper edge - thro occipital bone touch edge of lateral sinus and lambdoid suture. Struck posterior lobe traversing it, in nearly a horizontal plane, (passing forward) inclining to the right. In orifice of wound, scale of lead 2-1/2 in. in track, piece of bone - 2d piece of bone, about 4 inches in advance in track of ball - entered the left ventricle, behind, followed the course of ventricle accurately, inclining upwards and inwards - ploughing thro upper part of thalamus nervi opticum and lodged in cerebral matter, just above the corpus striatum of left side. The brain track of ball was in a fully disentegrated state and both ventricles, filled with blood. Whole brain engorged and bloody points, more marked than usual - on severing the dura mater was displayed a long coagulum of blood - lying upon the right hemisphere of brain - removing dura mater, (no wound in which was found) was found the orbital plates of both sides, the seat of comminuted fracture - the fragments being forced, from within, outwards. The orbito ocular palpebral membrane and cavity were filled with blood origin of which we didn't seek. The right had been notably protruded and afterwards, sank back after death. Ecchymosis of left eye 1st and right eye 2d - Great edema of serum and a little blood extravasated about shot. Wound, clean cut, as if by a punch (2 feet off) - orbital plates, very thin.

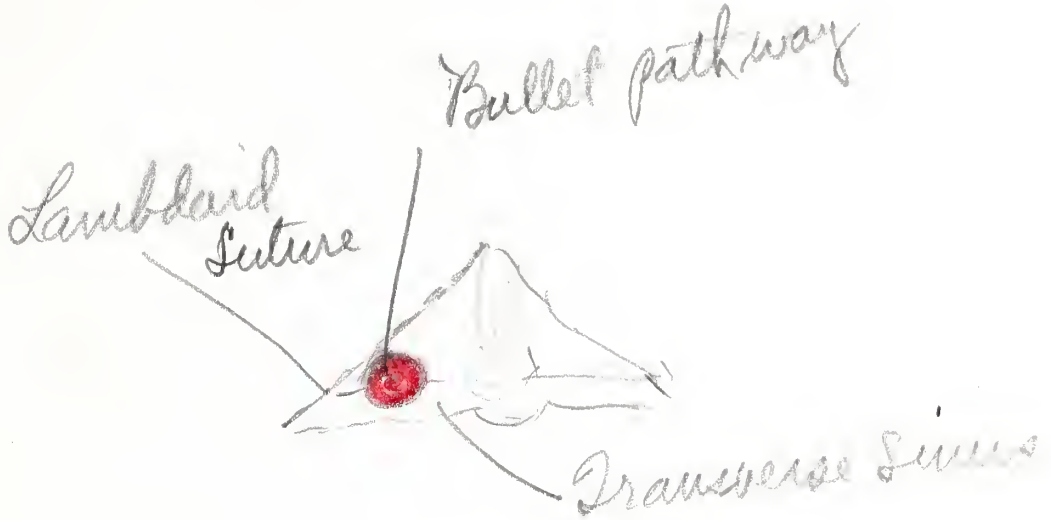
Notes Autopsy

President Lincoln

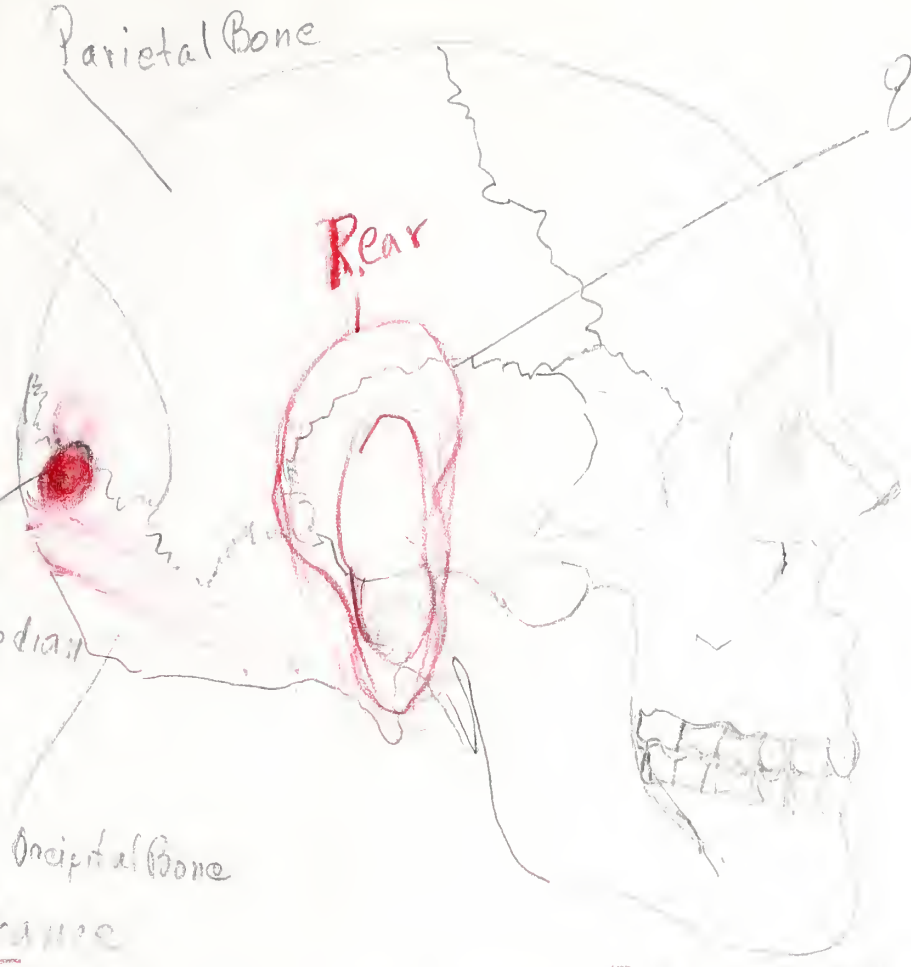
April 11th/65

Finding

Shot 1 inch, left mastoid time traversing left lateral sinus upper edge - thro occipital bone touch edge of lateral sinus and lambdoid suture. Struck posterior lobe traversing it, in nearly a horizontal plane, (passing forward) inclining to the right. In orifice of wound, scale of lead 2-1/2 in. in track, piece of bone - ed piece of bone, about 4 inches in advance in track of ball - entered the left ventricle, behind, followed the course of ventricle accurately, inclining upwards and inwards - ploughing thro upper part of thalamus nervi optikum and lodged in cerebral matter, just above the corpus striatum of left side. The brain track of ball was in a fully disintegrated state and both ventricles, filled with blood. Whole brain engorged and bloody points, more marked than usual - on severing the dura mater was displayed a long coagulum of blood - lying upon the right hemisphere of brain - removing dura mater, (no wound in which was found) was found the orbital plates of both sides, the seat of comminuted fracture - the fragments being forced, from within, outwards. The orbito ocular calperal membrane and cavity were filled with blood origin of which we didn't ascertain. The right had been notably protruded and afterwards, sank back after death. Ecchymosis of left eye lid and right eye lid - great edema of scrum and a little blood extravasated about same. Wound, clean cut, as if by a punch (a test off) - orbital plates, very thin.



Copy of drawing from Autopsy probably showing point of entry of bullet thru skull on left side nicking transverse sinus and touching edge of lambdoid suture.

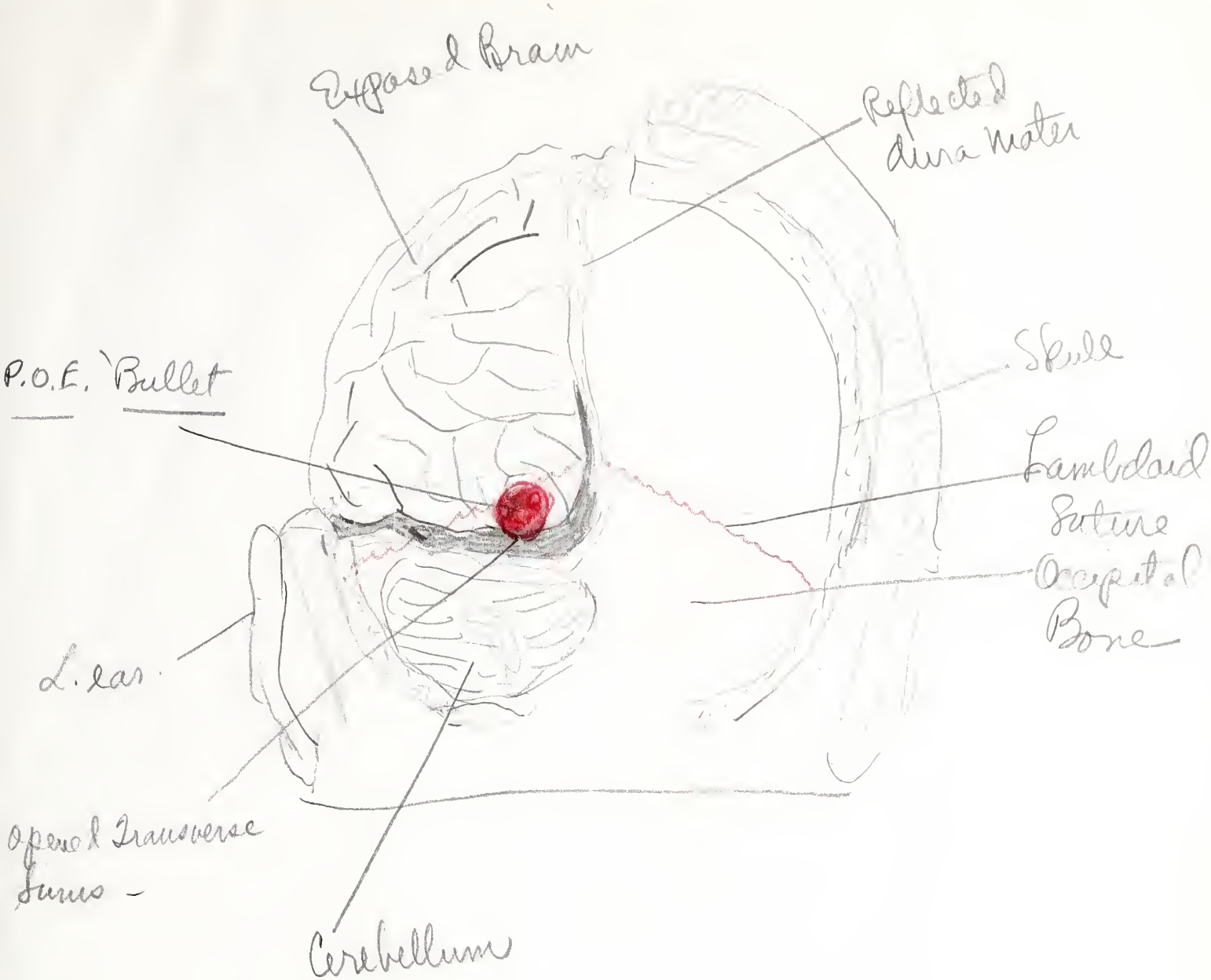


Point of entrance Bullet - (1" left medial line touching lambdoidal suture)

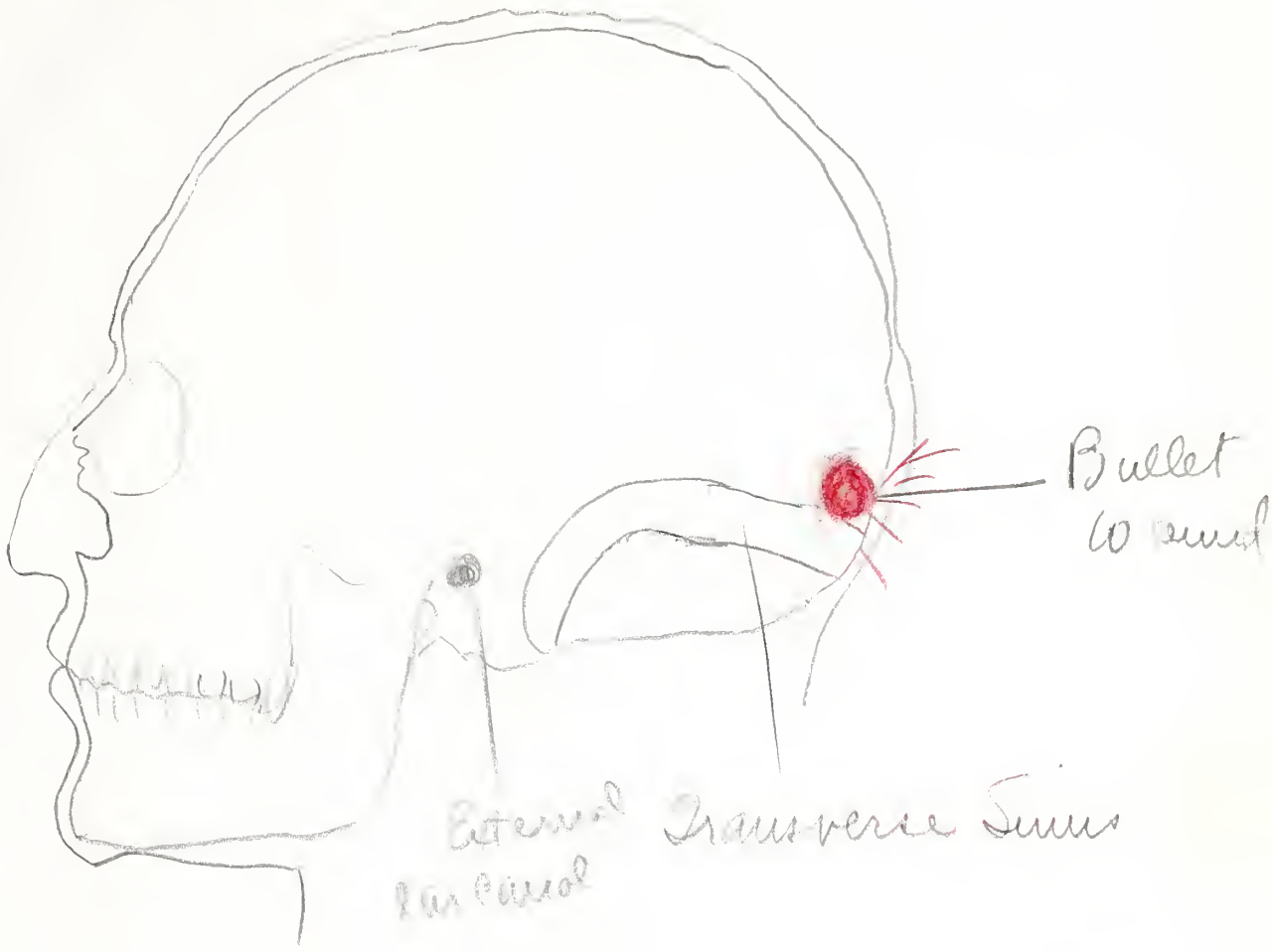
Point of entrance behind left ear + not above l. ear.

RIGHT LATERAL SURFACE OF SKULL ABOUT 1" ABOVE

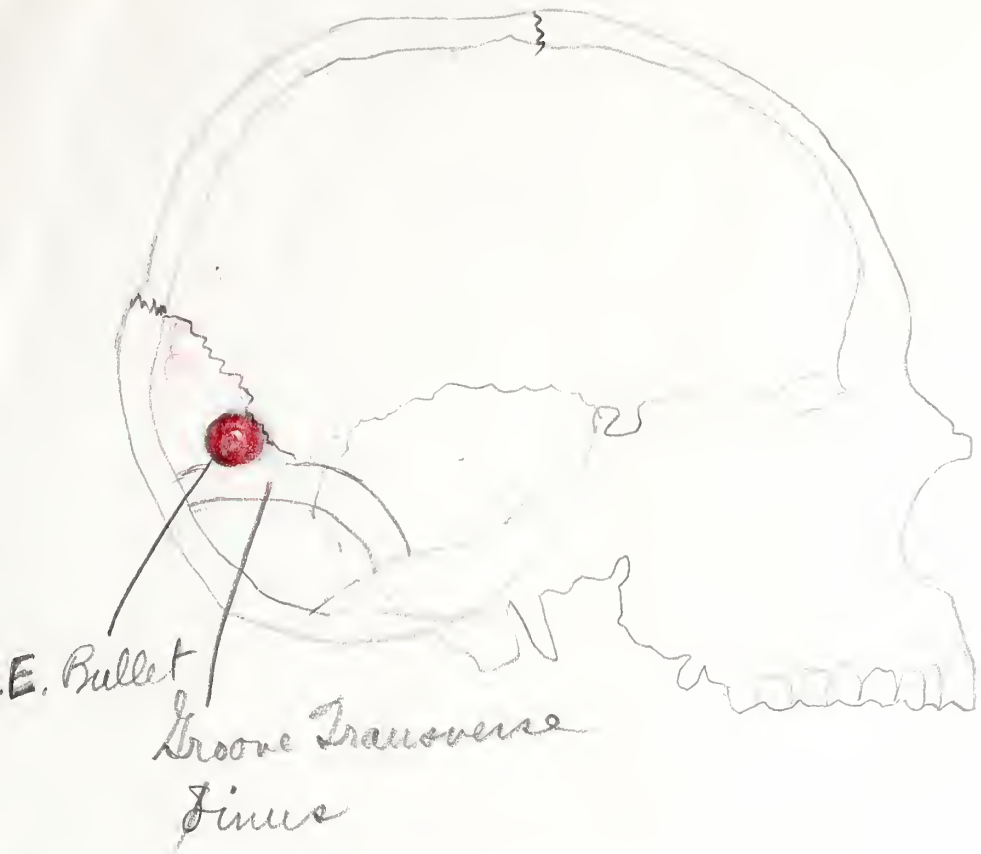
(Reverse for correct orientation)



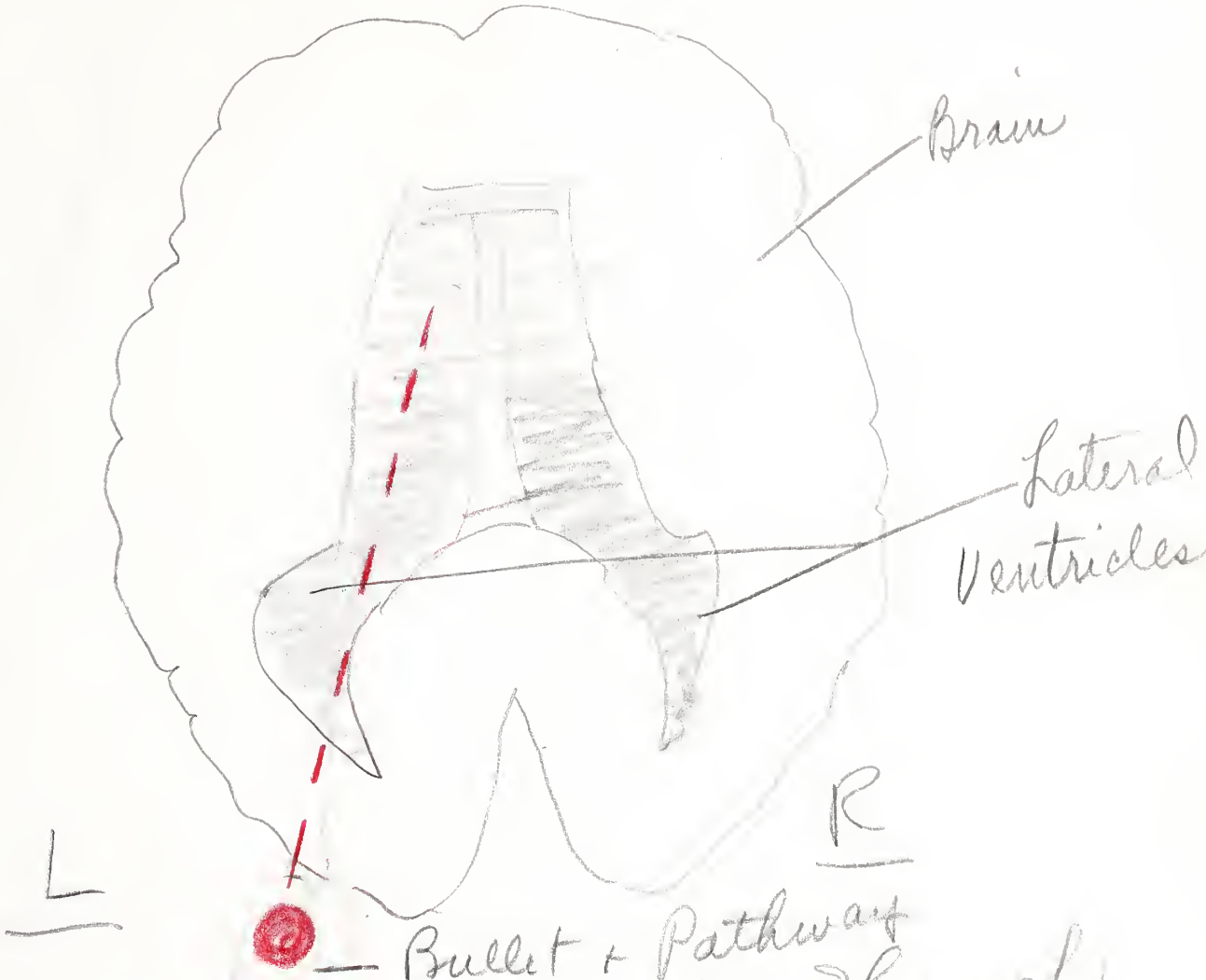
Rear View of Head with left side of brain exposed.



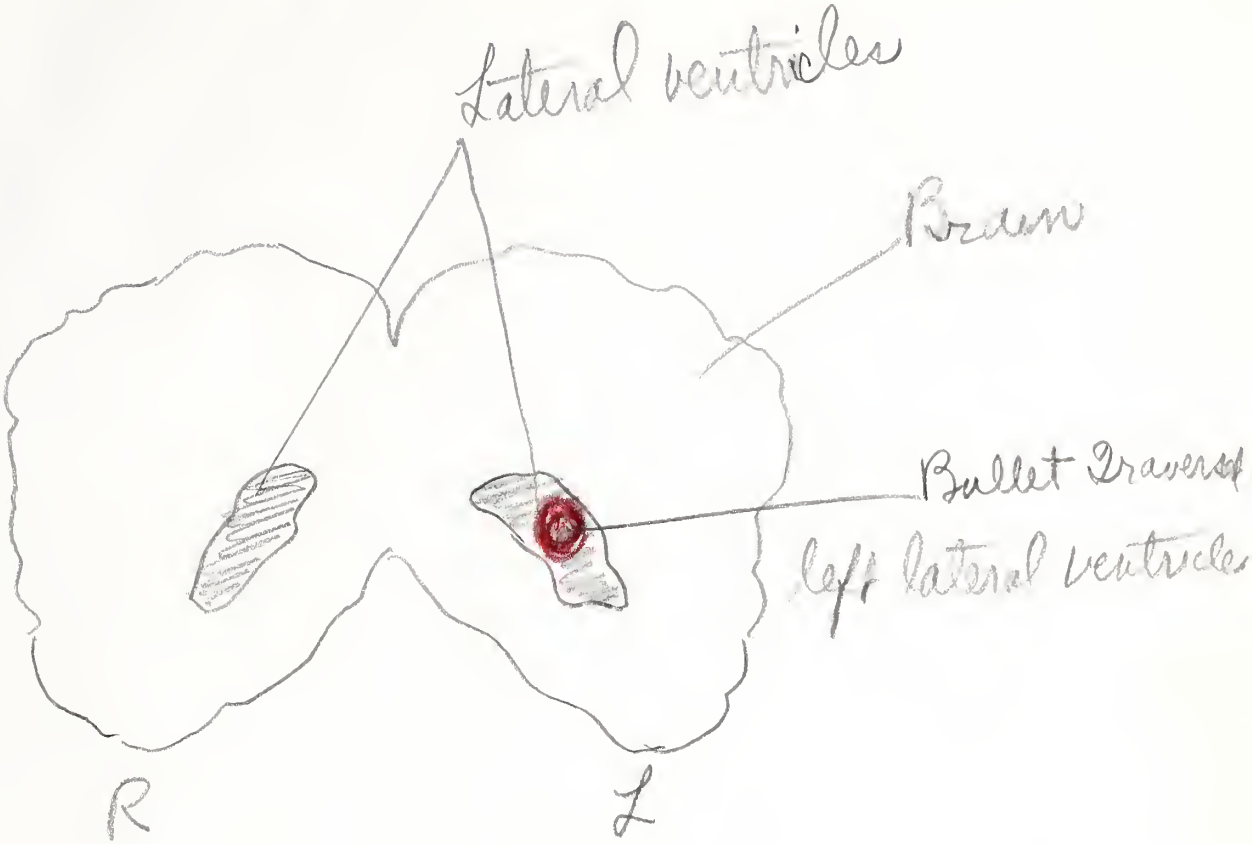
Topographic anatomy of skull
showing inner location of Transverse
Sinus



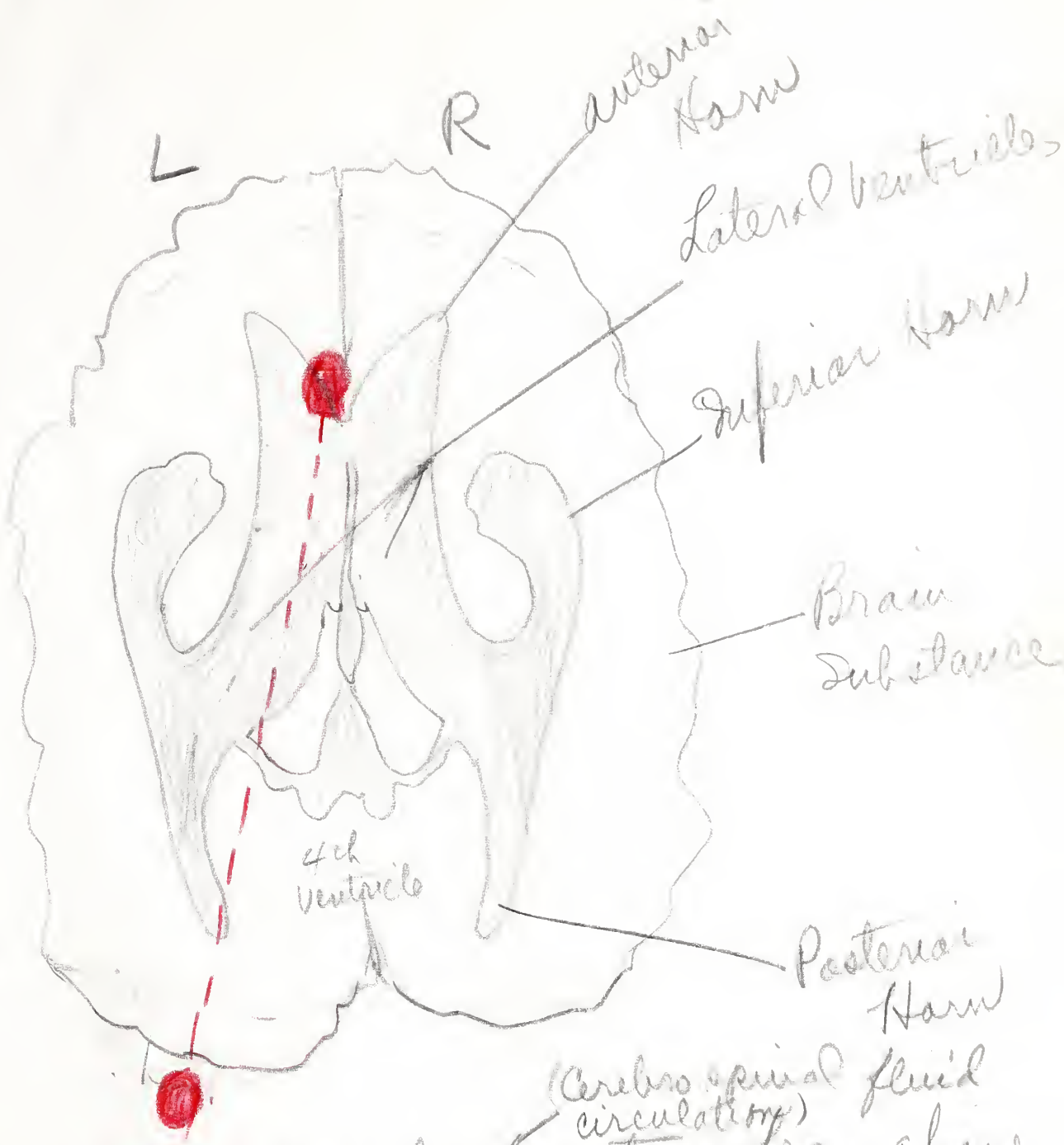
LEFT LATERAL VIEW, INTERIOR SKULL



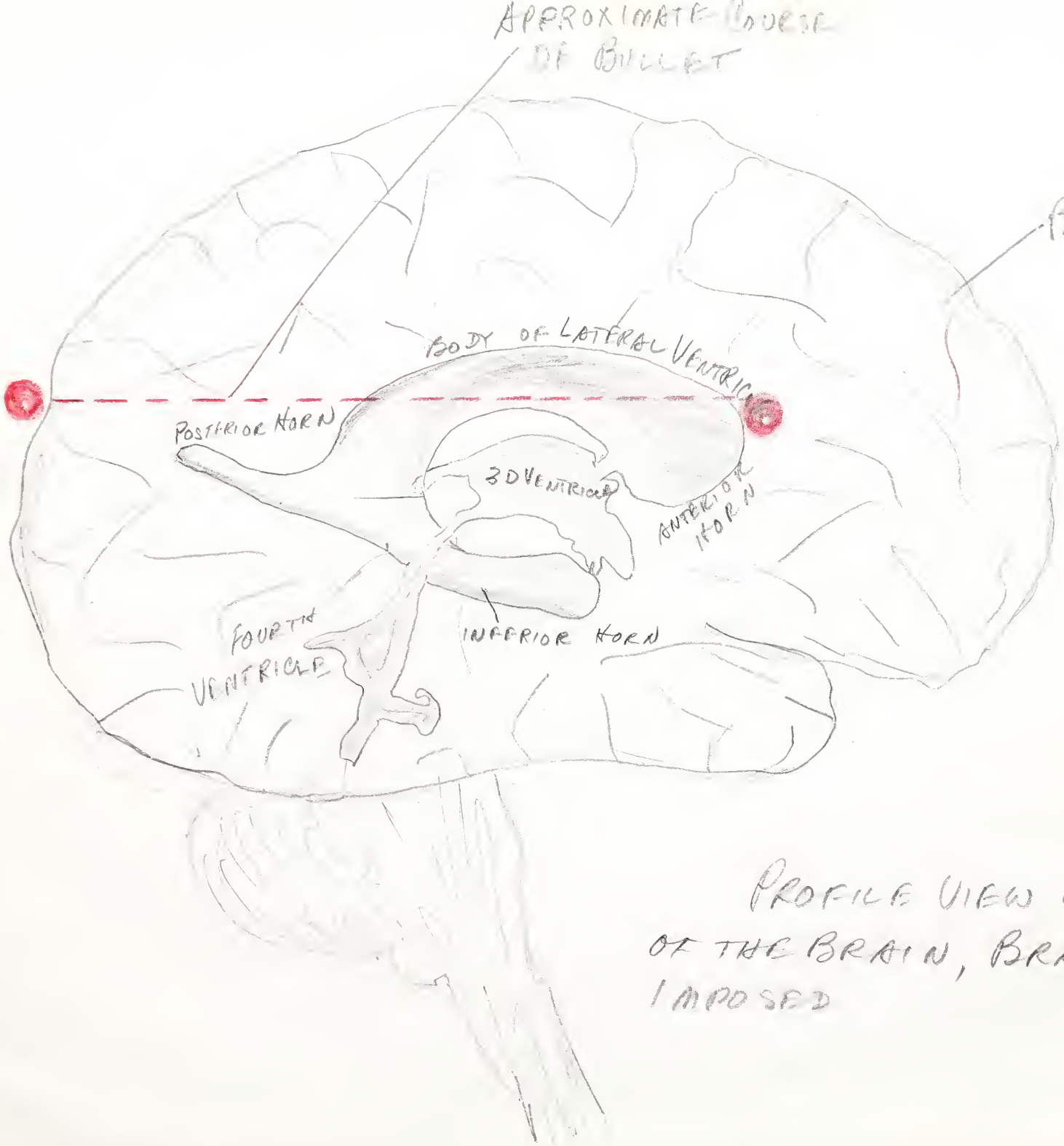
Longitudinal Section through Brain showing location of lateral ventricles



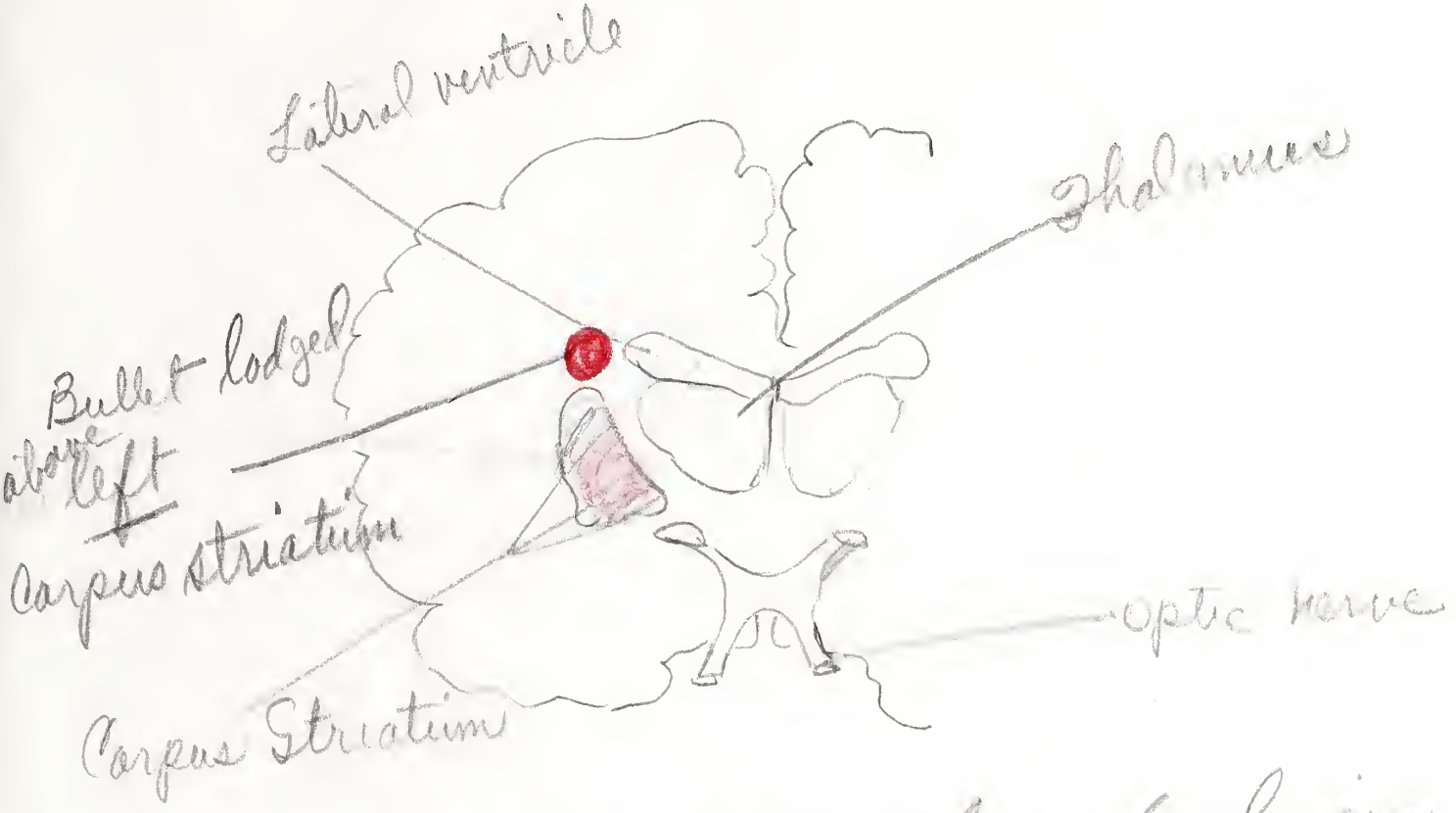
Cross section of brain looking from front to rear showing lateral ventricles



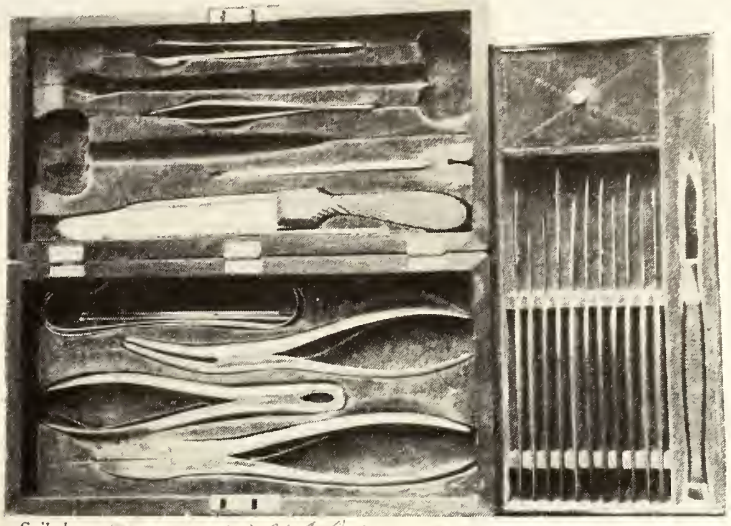
View of ventricular system from above showing lateral ventricles + path of bullet.



PROFILE VIEW OF VENTRICLES OF THE BRAIN, BRAIN SUPER-IMPOSED



Frontal section through brain showing corpus striatum (body of Caud.), thalamus and lateral ventricle



Soibelman

ENDING A SEVENTY YEAR MYSTERY THE INSTRUMENTS WITH WHICH AN UNKNOWN SURGEDN PERFORMED AN AUTOPSY ON THE BRAIN DF ABRAHAM LINCDLN HAVE BEEN TURNED DVER TD THE KING'S COUNTY MEDICAL SDCIETY IN NEW YORK. DETAILS OF THE AUTOPSY ARE UNAVAILABLE EXCEPT FOR A BRIEF NOTICE IN A MEDICAL JOURNAL.

MEDICO-SURGICAL TEAM AND PATHOLOGIST AT THE LINCOLN ASSASSINATION (In Order of Participation)

SCHOOLS	DATE		AGE:1865	PHOTO	STATUS
Bellevue MD	1865	1 Charles Augustus Leale 1842-1932	23	Yes	Asst Surg USA
		2 Charles Sabin Taft 1842-1889	23	Yes	Asst Surg USA
Penn MD	1861	3 Charles Mason Ford 1840-1884	25	Yes	Asst Surg USN
				NLM Neg No 62-15	
Penn AM	1861	4 Albert Freeman Africanus King 1841-1914 (English Born)	23	Yes	Asst Surg USA
Columbia MD	1865			NLM Neg No 57-17	
Vermont LLD	1904				
		5 Charles D Gatch	?	No	?
		6 Ezra W Abbott 1840-1906	25?	Yes	?
W Reserve MD	1845	7 Doctor Willard Bliss 1825-1889	40	Yes	Col MC USA
				NLM Neg No 52-434	
Harvard		8 Joseph K Barnes 1817-1883. SG USA 1864-82	48	Yes	Surgeon Gen
Penn MD	1838			NLM Neg No 60-592	USA
Yale BA MA	1844	9 Charles Henry Crane 1825-1883	40	Yes	Col MC USA
Harvard MD	1847			NLM Neg No 49599	Asst SG
Princeton BA CL	1842	10 Robert King Stone 1822-1872 Lincoln family doctor	43	Yes	Civilian
Penn MD CL	1845			NLM Neg No 60-148	
Center AB	1851	11 Lyman Beecher Todd 1832-1902 Mary's cousin	33	Yes	Civilian
Jefferson MD	1854			Filson Club	
U Berlin MD	1838	12 Charles H L Lieberman 1813-1886 (Polish Born USAR)	52	No 4/13	Civilian
Columbian MD	1834	13 John Frederick May 1812-1891	53	Yes	Civilian
				NLM Neg No 61-145	
Jefferson AB	1823	14 James CROWELL Hall 1805-1880	60	Yes	Civilian
Penn MD	1827			NLM Neg No 52-460	
Phil AB & MA	1850	15 Joseph Janvier Woodward 1833-1884 Pathologist	32	Yes	Asst Surg USA
Penn MD	1853			NLM Neg No 105645	
Harvard BS & CL	1859	16 Edward Curtis 1838-1912 Pathologist	26	Yes	Asst Surg USA
Penn MD	1865			NLM Neg No 60-542	
Jefferson MD	1861	17 William Morrison Notson C1842-1882 Barnes left him with Sewards	23?	Yes	Asst Surg USA
				NLM Neg No 105952	
Princeton AB MA	1849	18 George Alexander Otis 1830-1881 Curator Army Medical	35	Yes	Asst Surg USA
Penn MD	1851	Museum		NLM Neg No 61-13	

Gloria Moralez

J Willard Montgomery, M. D.

CHICAGO TRIBUNE, SATURDAY, JULY 31, 1965

HOW LINCOLN WAS SHOT IS UNRESOLVED

Whether John Wilkes Booth shot President Abraham Lincoln in the right or the left side of the head still is unresolved despite alleged new autopsy findings, an article in the Journal of the American Medical association stated yesterday.

The author is Dr. John K. Lattimer of Columbia university, New York City, who commented on the autopsy report of Dr. Robert King Stone, now at the New York State Historical association, Cooperstown, N. Y.

Hit Left Side

It has always been thought, according to Ralph Newman, Chicago Lincoln authority, that Booth had fired into the left side of Lincoln's head, the bullet lodging behind the President's right eye. This conclusion by the late Dr. Otto Eisenschiml, another Lincoln expert, was published by Newman in 1943. It was titled "The Case of A. L., Some Curious Medical Aspects of Lincoln's Death."

Dr. Lattimer held, after examining Dr. Stone's handwritten and hard-to-decipher manuscript that "while Dr. Stone seems to tip the scales somewhat more in favor of the site of [the bullet's] lodgement as being above the left eye, it unfortunately does not provide the diagrammatic evidence for which we had been hoping."

Approached from Right

Dr. Lettimer said:

"There was great confusion as to how the bullet hole came to be in the left side of Mr. Lincoln's head, since Booth had approached him from his [Lincoln's] right side. Against this background there is little wonder that conflicting testimony appeared."

Newman said the Dr. Eisenschiml's researches showed that a moment before the shot was fired, there was a disturbance in the audience in Ford's theater, where the President and Mrs. Lincoln were watching a play, and Mr. Lincoln turned his head to the left and away from the stage. Thus Booth's bullet, intended to enter the head from the right actually entered from the left.

8/2/65

Lincoln Contribution

Autopsy on Abraham Lincoln

Retrieval of a Lost Report

John K. Lattimer, MD

In recent weeks the press has carried accounts of the discovery, in the files of the New York State Historical Association at Cooperstown, NY, of a further handwritten description of the findings at the autopsy done on Abraham Lincoln. In these notes, Dr. Stone again makes a firm statement that the bullet ended up in the left anterior portion of the brain, above the left eye, instead of above the right eye as stated by two other persons present at the autopsy. It should be noted that the prosector, Dr. E.J.J. Woodward, also stated that the bullet ended up above the left eye.[1]

This new report by Dr. Robert King Stone, family physician of President Lincoln, is also accompanied by a small diagram. The newspaper accounts led me to hope that this diagram might show the track of the bullet through the brain. Unfortunately, the diagram appears to me to be designed only to show the position of the wound of entrance in relation to the left lateral venous sinus, at the back of the skull, which comes together with the corresponding lateral venous sinus from the opposite side, to meet the median venous sinus at the confluens sinuum, a slight venous dilation which also receives the superior sagittal venous sinus at the point of junction near the internal occipital protuberance of the skull. Dr. Stone's diagram shows a circle approximately one inch to the left of the mid-line, which I interpret as depicting the bullet hole, which indeed did traverse the left transverse venous sinus, according to all accounts of the autopsy.

My belief that the diagram is meant to show only the wound of entrance is strengthened by the fact that it appears in the portion of the three-page manuscript which describes the fact that the shot was "*one inch, left mid-line, traversing left lateral sinus, upper edge thro occipt bone touch edge of lat sinus and lambdoid suture*" [italics added].

From the Department of Urology, College of Physicians and Surgeons of Columbia University, New York.

Reprint requests to 620 W 168th St, New York 32 (Dr. Lattimer).

It is quite true that in this newly discovered notation, Dr. Stone stated quite clearly that the bullet "*lodged in cerebral matter, just above the corpus striatum of the left side*" [italics added]. Toward the end of page three he also refers to the fact that the ecchymosis of the left eye was "primary" and of the right eye "secondary," probably indicating that he thought the source of the hemorrhage on the left side was directly related to the location of the bullet, whereas the ecchymosis in the region of the right eye he regarded as having spread secondarily from the opposite side.

A fourth page of the manuscript, which appears to be a title page and is apparently written in the same hand, contains an obviously innocent error on the part of whoever wrote that page, in that it states, "*Notes Autopsy Prest. Lincoln Made Apl. 14th/65 Friday*" [italics added]. We know from the record that while Lincoln was shot on Friday, April 14, 1865, he did not die until 7:22 the next morning, and the autopsy was actually performed about noon on April 15, in his own bedroom at the White House (rather than on April 14, as stated in the Dr. Stone's newly discovered notation).

The text of the report follows, as nearly as I can interpret the handwriting (see facsimile). There are many abbreviations, with some false starts and corrections, combined with the traditionally poor physician's handwriting, which never seems to improve, no matter to what heights the doctor rises. Original spelling and punctuations have been preserved, for historical purposes.

NOTES AUTOPSY PREST. LINCOLN MADE APL.

14th/65 FRIDAY

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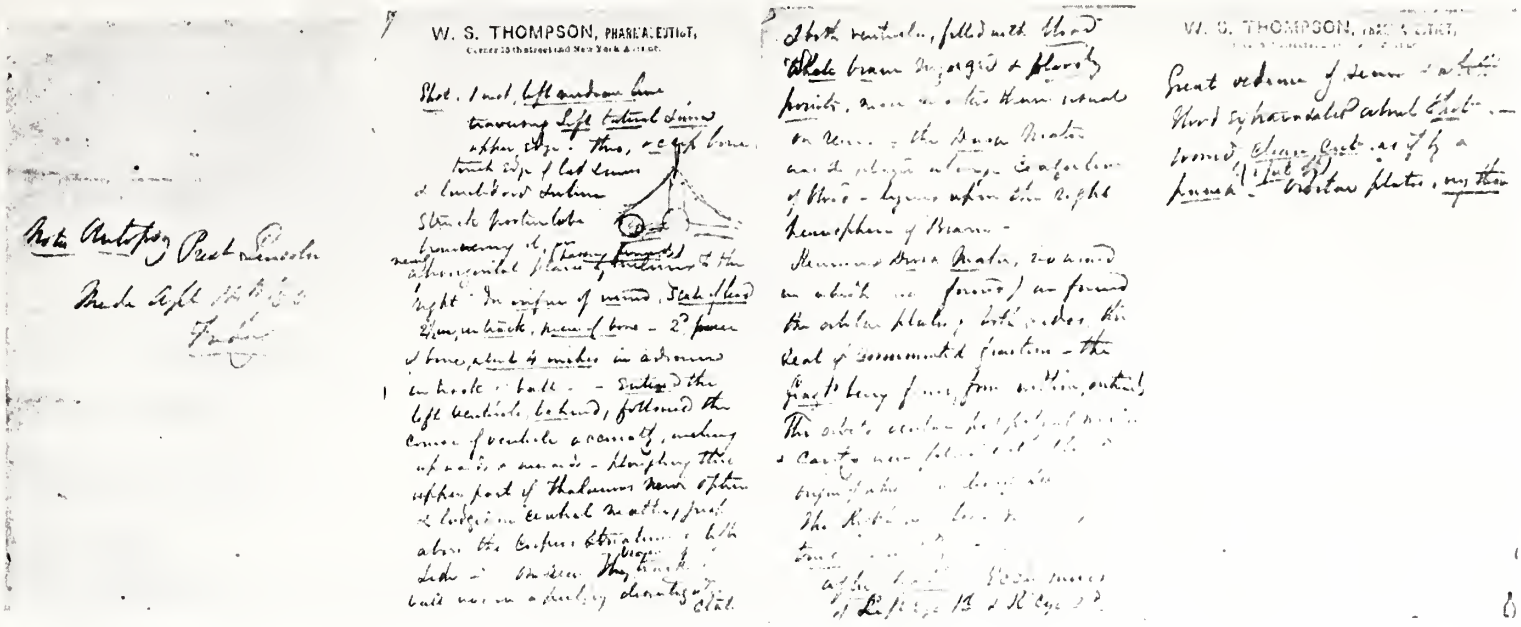


just above the corpus striatum of left side. The brain track of ball was in a pulpy disintegrated state & both ventricles, filled with blood. Whole brain engorged and bloody points, more marked than normal. On removing the Dura Mater was displaced a large coagulum of blood—lying upon the right hemisphere of brain.

Removing Dura Mater, (no wound in which, was found) we found the orbital plates of both sides the seat of comminuted fractures—the *fragts* being forced *from within, outwards.* The orbits, occular palpebral *membranes* and cavity were *filled with blood* origin of which we *didn't seek.* The right had been moderately *protruded* and after *ds* sank back after death. Ecchymosis of LEFT eye I_p and R eye 2_d. Great oedema of skin and a little blood extravasated about *shot* wound. *Clean cut* as if by a *punch* (2 fbts lft) orbital plates very thin.

Certainly this new notation in his own hand strengthens Dr. Stone's other recorded statements as to the location of the bullet above the left eye,[2] and continues to confirm the statement of Dr. Woodward as to the final resting place of the bullet. On the other hand, we still have the contradictory statements on the record, of Dr. C.S. Taft,[3] and the Surgeon General of the United States, Dr. Joseph K. Barnes,[4] both of whom stated clearly that the bullet lodged near the right eye, rather than the left.

It is certainly disappointing that the diagram which Dr. Stone provided of the area of entrance of the bullet was not followed by an additional diagram of the total path of the bullet through the brain, indicating its final site of lodgement. This would have gone far towards settling the uncertainties as to in which side the bullet did come to rest.

Attempts to deduce the final site of lodgement by interpretation of the neurological signs are disappointing when one finds in the literature clear statements by the two doctors who reached Lincoln first, who contradicted each other completely. Dr. Leale, who was the first on the scene, stated clearly that the pupil of the left eye was slightly dilated and the right pupil contracted,[5] whereas Dr. Taft, the second doctor at Lincoln's side, said the left pupil was much contracted and the right widely dilated.[3]

It must be remembered that all of the doctors who made these statements had been awake continuously for at least 30 hours, under the most severe emotional stress, by the time they attended the autopsy. There was great confusion as to how the bullet hole came to be in the left side of Mr. Lincoln's head, since Booth had approached him from his (Lincoln's) right side.[6] Against this background there is little wonder that conflicting testimony appeared.

While this newly discovered manuscript from Dr. Stone seems to tip the scales somewhat more in favor of the site of lodgement as being above the left eye, it unfortunately does not provide the diagrammatic evidence for which we had been hoping.

Dr. Stone's handwritten autopsy report is reproduced with permission from the New York State Historical Association and Paul Z. DuBois, librarian, Cooperstown, NY.

References

1. Woodward, J.J.: Report of Autopsy on President Lincoln, April 15, 1865; original in Surgeon General's office, Washington, DC.

2. Stone, R.K., in Pitman, B.: *Assassination of Abraham Lincoln and the Trial of the Conspirators,* New York: Funk & Wagnall Co., 1954, p 82.

3. Taft, C.S.: Last Hours of Abraham Lincoln, *Philadelphia Med Surg Rep* 12:452-454, 1865.

4. Barnes, J.K.: Testimony in "Trial of John H. Surratt," Washington, DC, House Report No. 7 of the 40th Congress, 1867, vol 1, p 121.

5. Leale, C.A.: *Lincoln's Last Hours,* pamphlet, published by the Loyal Legion, 1909; in possession of Helen Leale Harper, Jr., Pelham, NY.

6. Lattimer, J.K.: The Wound That Killed Lincoln, *JAMA* 187:485-489 (Feb 15) 1964.

(DUPLICATE)
Catalogued LF

Lincoln Autopsy Notes Clear Up

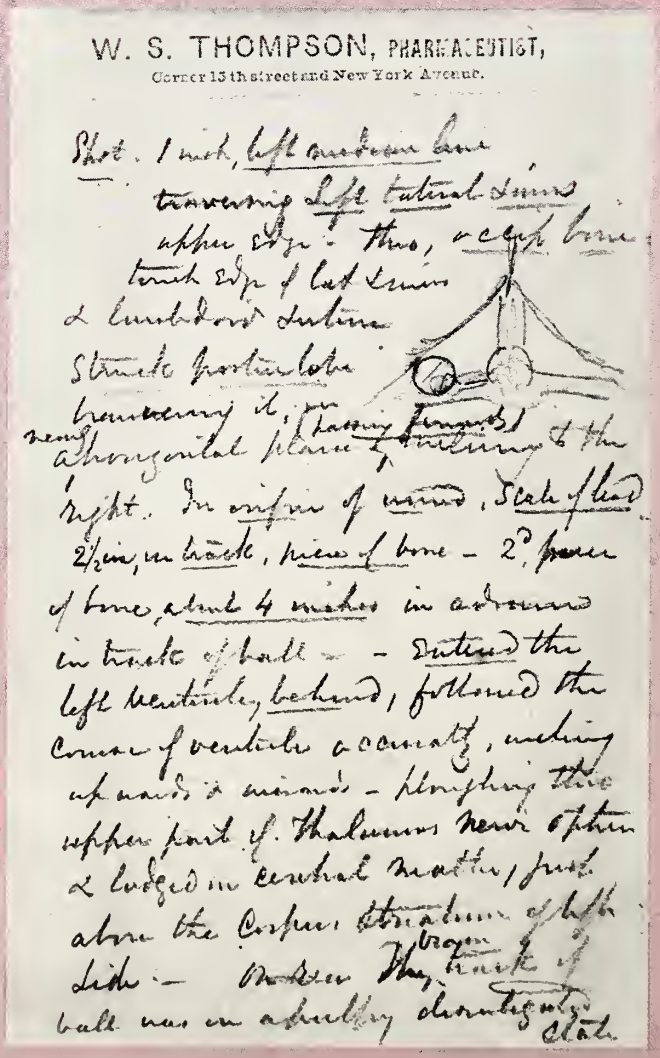
From a stack of uncatalogued manuscripts in a historical library, a new clue has turned up to help solve a century-old medical mystery: Where did the fatal bullet lodge in President Lincoln's brain?

The evidence is a set of notes written by Dr. Robert King Stone, Lincoln's personal physician. After having been in the hands of private collectors for years, they have just been made public by the New York State Historical Association.

The published medical records of Lincoln's wound, his death, and autopsy are highly contradictory. One set of contemporary accounts says that the assassin's bullet went from left to right through the brain and finally lodged above the right eye. Other versions state that the bullet was found above the left eye.

Dr. Stone was one of several physicians present at the autopsy, which was performed by Assistant Surgeon J. Janvier Woodward of the Army. Also present were Army Surgeon General Joseph K. Barnes and Acting Assistant Surgeon Charles S. Taft. There is a basic discrepancy between the medical testimony of Drs. Barnes and Taft on the one hand and Drs. Woodward and Stone on the other.

The official autopsy report, submitted by Dr. Woodward to Surgeon General Barnes, declares that "the ball entered through the occipital bone about one inch to the left of the median line and just above the left lateral sinus, which it opened. It then penetrated the dura mater, passed through the left posterior lobe of the cerebrum, entered the left lateral ventricle, and lodged in the white matter of the cerebrum just above the anterior portion of


W. S. THOMPSON, PHARMACEUTIST,
Corner 15th street and New York Avenue.

Shot. 1 inch, left median line
traversing Left lateral sinus
upper edge. thro, occip bone
touch edge of lat sinus
& lambdoid suture
struck posterior lobe
traversing it, in
nearly horizontal plane (passing forwards) inclining to the
right. In orifice of wound, Scale of lead
2½ in, in track, piece of bone – 2d piece
of bone, about 4 inches in advance
in track of ball – – entered the
left ventricle, behind, followed the
course of ventricle accurately, inching
up wards & inwards – ploughing thro
upper part of Thalamus nervi optica
& lodged in cerebral matter, just
above the Corpus Striatum of left
side – The brain track of
ball was in a pulpy disintegrated state

EYEWITNESS REPORT OF HISTORIC POSTMORTEM

"Shot 1 inch left median line traversing left lateral sinus upper edge—thro occip bone touch edge of lat sinus & lambdoid suture struck posterior lobe traversing it, in a nearly horizontal plane (passing forwards) inclining to the right. In orifice of wound, scale of lead 2½ in. in track, piece of bone—2d piece of bone about 4 inches in advance in track of ball—entered the left ventricle, behind, followed the course of ventricle accurately, inching upwards & inwards —ploughing thro upper part of thalamus nervi optica & lodged in cerebral matter, just above the Corpus Striatum of left side—The brain track of ball was in a pulpy disintegrated state & both ventricles, filled with blood—Whole brain engorged & bloody prints, more marked than usual on removing the Dura Mater was displayed a large coagulum of blood—lying upon the right hemisphere of brain—Removing Dura Mater (no wound in which, was found) we found the orbitar plates of both sides, the seat of comminuted fracture—the fragts being forced, from within, outwards The orbito ocular palpebral membrane & cavity was filled with blood origin of which—we didn't seek The Right had been noticeably protruded & after d. sank back after death. Ecchymosis of Left Eye 1st & R Eye 2d Great oedema of serum & a little blood extravasated about shot—wound, clean cut as if by a punch (2 feet off)—orbitar plates, very thin."

100-Year Puzzle

Doctor's on-the-spot record confirms disputed site of assassin's bullet

the *left* corpus striatum, where it was found."

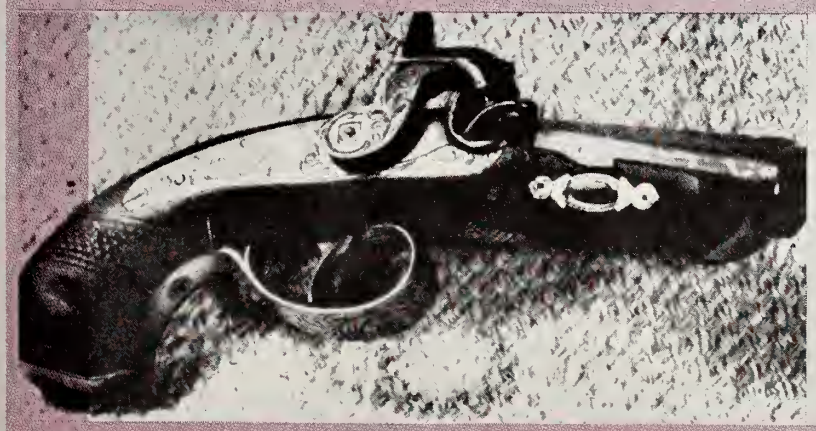
But two years later, when General Barnes testified at the trial of John H. Surratt, one of John Wilkes Booth's co-conspirators, he declared that "the bullet entered the skull to the left of the middle line, and below the line with the ear. It ranged forward and upward toward the *right* eye, lodging within a half inch of that orbit."

A similar version was offered by Dr. Taft. In the *Philadelphia Medical and Surgical Reporter* a week after Lincoln's death, Dr. Taft stated: "The calvarium was removed, the brain exposed and sliced down to the track of the ball, which was plainly indicated by a line of coagulated blood extending from the external wound in the occipital bone, obliquely across from left to right through the brain, to the anterior lobe of the cerebrum, immediately behind the *right* orbit."

Yet Dr. Taft seems to have contradicted himself. In describing the efforts of the Surgeon General to explore the wound while the President was still alive, he said that Dr. Barnes passed a Nélaton probe for a distance of two inches beyond the plug of bone, "when the ball was distinctly felt; passing beyond this, the fragments of the orbital plate of the *left* orbit were felt."

Mr. Lincoln's own physician, Dr. Stone, also testified at the Surratt trial. At that time, he said that the ball was found in the anterior part of the left side of the President's brain.

***Death watch** by President's physicians and Cabinet lasted nearly nine hours. Fatal ball, measuring a half inch in diameter, came from .44-cal. derringer.*



Day Without End

This left the question open. Had Drs. Barnes and Taft been mistaken, or had Dr. Woodward been confused in dictating his autopsy notes? Was Dr. Stone's memory faulty when he testified two years later?

This is the point now clarified by the publication of Dr. Stone's notes. The President's physician had been summoned to Lincoln's deathbed on the night of April 14, 1865, within an hour after the shooting. He had watched out the night until the President died at 7.22 a.m. Then he had been with the bereaved family, giving them comfort and also securing their permission for the autopsy. Fourteen hours of staggering events must have telescoped in his mind, for his hasty jottings are dated April 14, the day that for him had not ended.

While Dr. Woodward performed the autopsy, Dr. Stone apparently stood by, hastily scrawled the fragmented sentences, and made a little sketch on a prescription pad from a local Washington pharmacy.

He places the bullet "just above the corpus striatum of the left side." His sketch, a dorsal view, clearly shows the orifice made by the bullet on the left side of the brain.

In a *JAMA* report last year on the conflicting accounts of the autopsy, Dr. John K. Lattimer of New York commented on the relevance of Lincoln's long death struggle: "If the bullet did traverse the brain stem, damaging it directly, it is surprising that respiration could be maintained at all."

The question may never be completely settled. But Dr. Stone's on-the-spot notes seem to lend strong weight to one side of the controversy. ■

How Did Lincoln Die?

Everyone knows that the ball John Wilkes Booth fired into Abraham Lincoln's brain inflicted a terrible, mortal wound. But when a prominent neurosurgeon began to investigate the assassination, he discovered persuasive evidence that Lincoln's doctors must share the blame with Booth's derringer. Without their treatment the President might very well have lived.

A life mask of Lincoln made not long before his death.

BY RICHARD A. R. FRASER, M.D.

THREAT OF ASSASSINATION MAY SEEM the greatest risk a President of the United States must take upon entering office, but history suggests that until recently a Chief Executive's life was threatened more by his post-assault medical treatment than by his assassin's bullet. There have been at least eleven attempts on the lives of American Presidents, four of them successful. John F. Kennedy was shot with a high-velocity bullet that destroyed his brainstem, an instantly fatal injury that rendered any medical treatment useless. The three other victims did not immediately suffer fatal wounds.

Both James Garfield and William McKinley received substandard medical care after being shot, which

ORIGINAL MILLS MASK, COLLECTION OF LLOYD OSTENDORF, DAYTON, OHIO

probably contributed more to their deaths than the wounds themselves. Garfield, who was shot in 1881, died of sepsis, an infection that may result from any wound but in his case most likely resulted from a series of unsterile wound probes by his doctors. It is curious that while Garfield's doctors took every other antiseptic measure throughout the case, they explored the wound with naked fingers *fourteen times*, repeatedly engaging in a practice thoroughly condemned by medical texts of the day.

McKinley's death twenty years later also appears to have been the result of his doctors' poor judgment. The surgeon who attended him, Dr. Mathew Mann, was an obstetrician-gynecologist who had never operated on a gunshot victim and should have declared himself unqualified. Dr. Herman Mynter, the first surgeon on the scene, was responsible for the hasty appointment of Dr. Mann. Mynter decided that the surgery must be performed as soon as possible, and Mann lived nearby. However, the time it took actually to begin operating would have been sufficient to bring the wounded President to one of the most advanced medical facilities in the country, the Buffalo General Hospital, which owned one of the first X-ray machines and employed doctors well qualified to perform the procedure. Instead McKinley was taken to an ill-equipped, unlit room in the Exposition Hospital and, like Garfield, died of sepsis.

AFTER HAVING DISCOVERED THE quality of medical care given to these two American Presidents, I thought it reasonable to investigate the care of their predecessor, Abraham Lincoln. Many details of the event that took place on the night he was shot are obscured by misleading and contradictory accounts, but a consensus of various sources maintains certain facts.

On the evening of April 14, 1865, five days after General Lee surrendered his exhausted army, President Abraham Lincoln attended a performance of *Our American Cousin* at Ford's Theater in Washington. He arrived late, at approximately 8:15 P.M., and the play was briefly halted to welcome his entrance. Lincoln was accompanied to the President's box with his wife and his guests, Miss Clara Harris and her fiancé, Maj. Henry R. Rathbone. At around ten o'clock John Wilkes Booth, who frequently performed at Ford's Theatre and had a close rapport with most of the staff, walked into the theater's main entrance and approached the ticket taker, Joseph ("Buck") Buckingham, whom he knew very well. Jokingly Booth asked him, "You'll not want a ticket from me?" Buck laughed and told his friend, "Courtesy of the house." Booth headed up the stairs to the dress circle.

BOOTH STOOD four feet behind the President and pulled the trigger; Lincoln's head dropped to his chest.

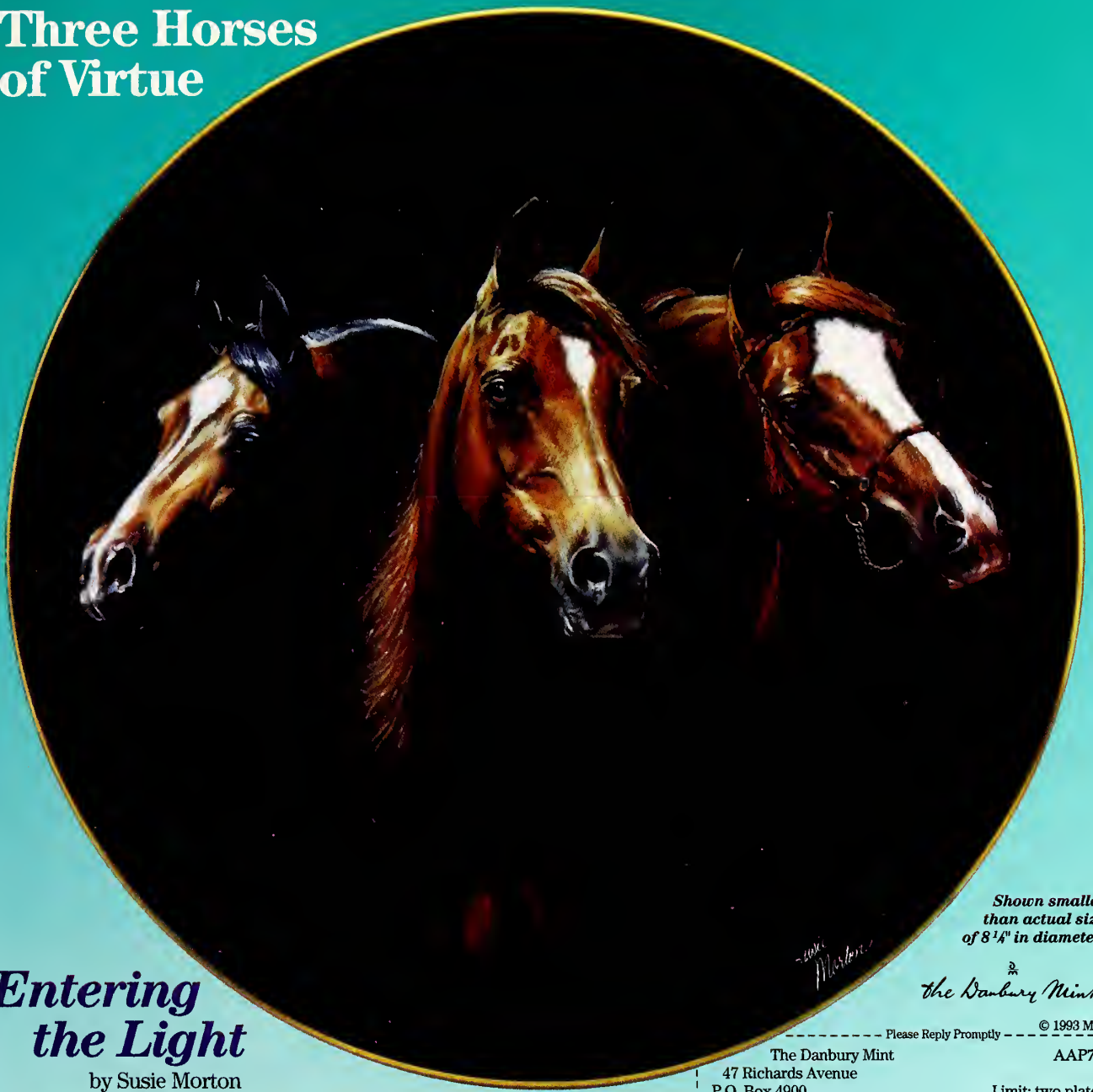
Sometime between ten-fifteen and ten-thirty, he entered the President's box. Lincoln, his attention temporarily diverted from the stage, was sitting with his head tilted forward and to the left, probably watching a musician in the orchestra. Standing about four feet behind the President, Booth pulled the trigger of his derringer and Lincoln's head dropped to his chest.

The first doctor to reach the wounded President was Charles A. Leale. He was the assistant surgeon of United States Volunteers and only twenty-three years old. The remainder of this account of Lincoln's death is taken mostly from a report Leale rewrote from notes he made the day Lincoln died and submitted to the Congressional Assassination Committee in 1867. Directly after Leale saw Booth leap onto the stage, wave a dagger, and hurry toward the exit, the doctor heard shouts for a surgeon. Leale made his way to the President's box. "While approaching the President—I was told that—he had been murdered, and I sent for some brandy and water." He arrived at the box and saw Major Rathbone standing at the door. Lincoln was sitting on a high-backed armchair with his head leaning toward his right side, supported by Mrs. Lincoln. Miss Harris was at the left and behind the President.

WHEN THE SURGEON REACHED Lincoln, he found him paralyzed, with his eyes closed. Leale placed his finger on the right radial pulse but felt no movement. With assistance Leale immediately placed the President in a recumbent position, and in the process his hand came in contact with blood on Lincoln's left shoulder. He thought that perhaps the President had been stabbed with the dagger, but found no wound. Continuing to examine the patient, Leale noticed that the pupils were dilated, and he discovered a large clot of blood about one inch below the superior curved line and an inch and a half to the left of the median line of the occipital bone in the back of the skull. He passed the little finger of his left hand through the hole made by the ball. Lincoln "was then apparently dead," Leale wrote in his report, but when he removed his finger, blood oozed out, and the President "soon commenced to show signs of improvement."

There is some question about what occurred next. Leale's account of the assassination submitted in 1867 made no mention of resuscitation, but in 1909 he delivered an address in New York giving a detailed description of practicing mouth-to-mouth resuscita-

Three Horses of Virtue



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tion on Lincoln after he probed the wound. It is strange that Leale did not include this in his first account, which omitted no other important details of the President's treatment. I am more inclined to give credence to this earlier version, recorded in Leale's own hand the day Lincoln died.

In any event, this resuscitation, if it actually occurred, was directly followed by the arrival of an Army surgeon, Dr. Charles S. Taft, and Dr. A. F. A. King of Washington, at which point the three doctors agreed to remove the stricken President. Leale was asked to put Lincoln in a carriage to take him to the White House, but he refused for fear that the President would die if placed upright. Instead Lincoln was taken across the street to the nearest house, which belonged to a Mr. William Petersen, and was placed on a bed—diagonally because he was too tall to fit lengthwise. Leale asked that everyone leave the room with the exception of "the medical gentlemen." After undressing the patient, Leale found that the President's lower extremities were quite cold "to a distance several inches above his knees." He sent for the surgeon general, J. K. Barnes, the family physician, Robert K. Stone, and the commander of the Armory Square Hospital, D. W. Bliss. The moment Dr. Stone arrived, Leale gave control of the President's care over to him. (Dr. Bliss is unique in being the only surgeon to participate in the care of two assassinated Presidents; he helped preside over President Garfield's post-assault care sixteen years later. The quality of his conduct in that case and that of his colleague Dr. Weiss, an anatomist, prompted one reporter's acid comment: "If ignorance is Bliss, 'tis folly to be Weiss.")

When Lincoln was first laid in bed, a "slight ecchymosis of blood" (a spot from a rupture) was noticed on his left eyelid, and the pupil of that eye was dilated. At 11:00 P.M. the right eye began to protrude, and this was followed by an increase of the ecchymosis, until it encircled the right orbit. The wound was kept open by the surgeon general with a silver probe. Dr. Taft remarked that at 11:30 a twitching of the facial muscles of the left side set in and continued for about fifteen to twenty minutes, and "there was artificial heat to the extremities." At 1:00 A.M. "spasmodic contractions of the muscles came on," and "at about the same time both pupils became widely dilated and remained so until death." Presumably at this moment Lincoln became decerebrate—brain dead.

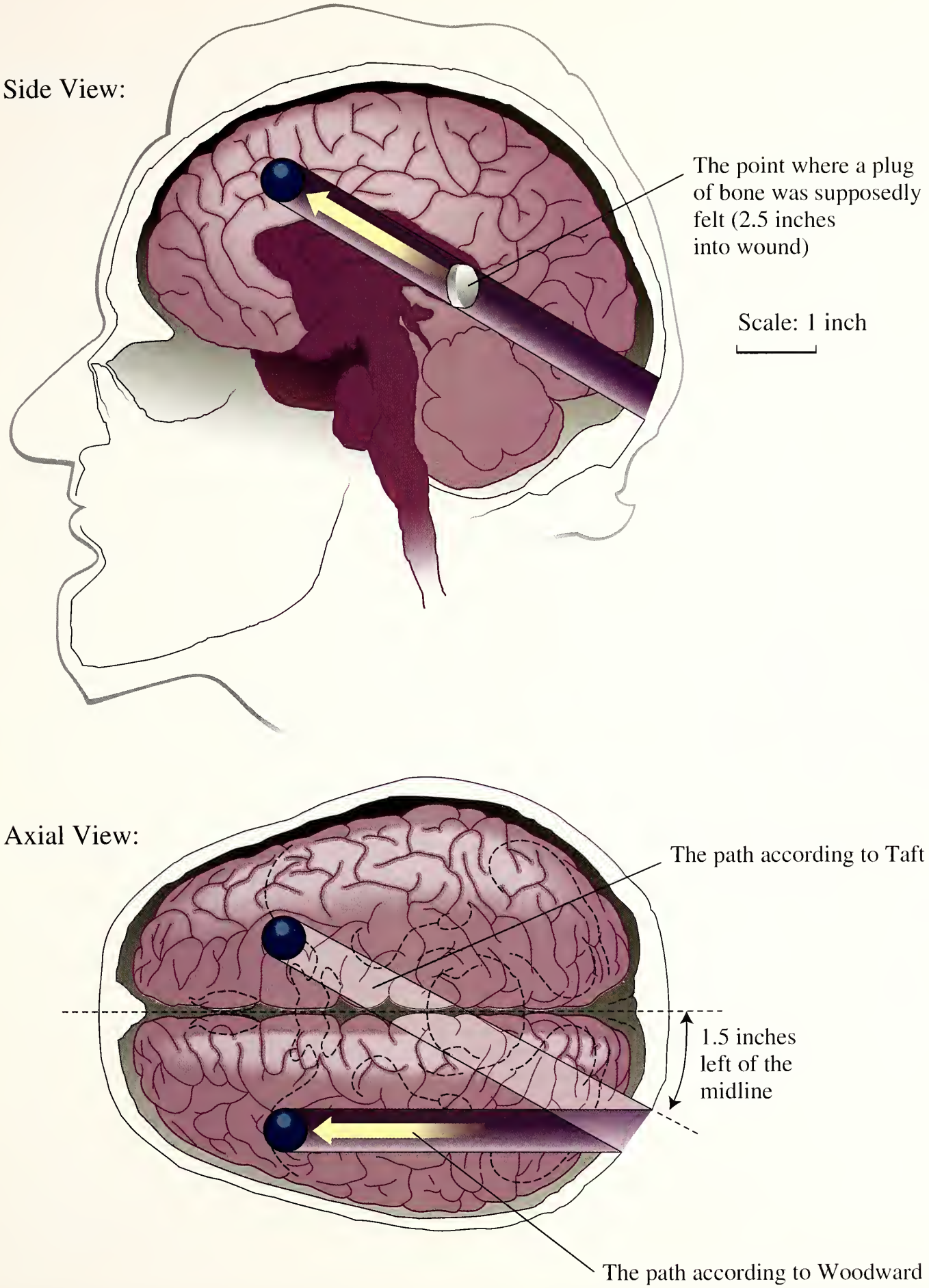
> The probe hit a foreign substance and kept going until it felt another one, at first thought to be the ball.

At 2:00 A.M. a doctor's aide arrived with a Nelaton's probe, and an examination of the wound was made by the surgeon general. The probe was driven about two and a half inches when it hit a foreign substance. This was passed, and then the probe felt another hard substance, which was at first thought to be the ball. However, when the probe was removed without a lead stain, the obstacle was thought to be another piece of bone. The probe was introduced a second time, and the ball "was supposed to be distinctly felt by the Surgeon General." Taft accounts for the ball's not making any mark on the probe by explaining that it "was afterwards found to be of exceedingly hard lead." Following the probes, "Nothing further was done except to keep the wound free from coagula." Taft remarks on the "great difference in character of the pulse whenever the orifice of the wound was freed from coagulum" and adds that "while the wound was discharging freely, the respiration was easy, but the moment the discharge was arrested from any cause, it became at once labored."

During the night doctors counted pulsations, and at 6:50 A.M. respirations ceased for some time. Lincoln lived about thirty minutes longer, during which time Rev. Phineas Gurley said, "Let us pray," and everyone knelt beside the bed. At 7:22 A.M., Lincoln "breathed his last."

Ford's Theatre Museum, where the weapon is currently kept, gave me a detailed description of the gun that Booth used to assassinate President Lincoln. It is a single-shot muzzleloading Philadelphia derringer with a percussion cap. Its total length is $5\,^{27}/_{32}$ inches, but the barrel is only $1\,^{15}/_{16}$ inches long. The interior diameter of the barrel is 0.4375 inch, making the gun a .44-caliber pistol (caliber refers to the barrel and/or bullet diameter in inches). The derringer shot a round lead ball. Usually a gun fires a bullet or ball of approximately the same caliber, but the pathological examination of the ball that killed Lincoln suggests that Booth used a .41-caliber ball in his .44 derringer.

The National Museum of Health and Medicine currently owns the ball that killed Lincoln. On April 6, 1971, the ball was examined. It weighed 6.314 grams and was found, by spectroscopy, to be principally lead. Its weight was not the same as at the time Booth shot it, for three reasons: the lead had corroded, and the corrosion was easily rubbed off in handling the ball; it had a small hole drilled into it prior to 1941 for mounting at an exhibition; and most significantly, part of the ball had been broken off by the skull when it entered the President's head. This fragment was found during the autopsy but was later lost. The ball was flattened by the impact of the shot; in



STEVE STANKIEWICZ

1971 it was measured at 13.3 mm in diameter at its widest and 12.1 mm at its narrowest point and was 7.2 mm from front to back.

THE MOST WIDELY ACCEPTED CURRENT theory that attempts to describe the extent of tissue damage incurred by a missile states that its wounding capacity is proportional to its kinetic energy, which may be calculated with the formula: $KE = {}^1/_2\, mv_2$. In other words, the kinetic energy of a missile is proportional to the missile's mass times the square of its velocity. The kinetic energy, and therefore the wounding capacity, of a bullet is much more dependent on its velocity than on its mass. If a bullet's mass is doubled, its kinetic energy is doubled; if a bullet's velocity is doubled, its kinetic energy is quadrupled.

The derringer fired by Booth had a very low muzzle velocity—around four hundred feet per second, which is about that of most of today's air guns. To calculate the ball's kinetic energy, the only further measurement needed is its mass. Since the ball was weighed after a significant amount of its volume had been lost, it seems sensible to estimate its original mass using the density of lead and the volume of a .41-caliber sphere, which would have been 6.7 grams.

From this it can be calculated that the kinetic energy of the missile that killed Lincoln was 36.7 foot-pounds. Today this magnitude of kinetic energy is associated with guns of a much lower caliber. A .22-caliber short revolver, for example, produces approximately 48 foot-pounds of kinetic energy. A pathologist describing the wound of a twenty-year-old male who shot himself in the head with this type of gun noted that the bullet entered the brain in the right temporal lobe and perforated the left parietal lobe before lodging in the left occipital region. The bullet's track was straight and cylindrical, tapered at the entrance and lodgment areas, and about three centimeters wide in the middle. This wide area is the result of cavitation, a phenomenon common to missile wounds. Lower-velocity bullets will normally produce little or no cavitation, while high-velocity ones transfer more of their kinetic energy to the tissue and produce large temporary and permanent cavities. A temporary cavity is formed when the missile's kinetic energy separates the soft tissue around where it strikes, producing a wide opening for a fraction of a second before the tissue recedes back toward its normal position. If the tissue does not recede completely, a permanent cavity is formed.

THE DERRINGER had a very low muzzle velocity—around four hundred feet per second, about that of today's air guns.

The shape and size of this cavity also depend on variables other than kinetic energy, such as yaw—the wobbling motion of a bullet—and the effect of secondary missiles that form when the bullet's kinetic energy is transferred to bone, which fragments and itself becomes projectiles. When the bullet enters tissue, it chisels out a cavity much larger than its own diameter. A ball cannot produce yaw because it has no longitudinal axis to wobble on, and no secondary missiles were formed in Lincoln's injury because, other than entering the occipital bone, the ball encountered only soft brain matter. The occipital bone that was hit was driven like a plug and found in the autopsy about two and a half inches down the missile track. The hole made in the bone, wrote a witness to the autopsy, "was as cleanly cut as if done with a punch." The absence of yaw and secondary missiles combined with the ball's low velocity should have rendered the effect of cavitation in Lincoln's wound minimal, and indeed, the autopsy report seems to indicate the ball's having made a fairly clean, narrow track.

Curiously there are two completely different versions of the autopsy report. The autopsy itself was performed by Assistant Surgeon J. Janvier Woodward, who hand-wrote a description the day Lincoln died. According to him, "the ball entered through the occipital bone about one inch to the left of the median line and just above the left lateral sinus, which it opened. It then penetrated the dura mater, passed through the left posterior lobe of the cerebrum, entered the left lateral ventricle and lodged in the white matter of the cerebrum just above the anterior portion of the left corpus striatum, where it was found. . . ."

DR. C. S. TAFT, WHO WAS PRESENT but did not participate in the autopsy, wrote an entirely different report: "The calvarium was removed, the brain exposed, and sliced down the track of the ball, which was plainly indicated by a line of coagulated blood extending from the external wound in the occipital bone, obliquely across from the *left to right* through the brain to the anterior lobe of the cerebrum, immediately behind the *right* orbit. The surface of the right hemisphere was covered with coagulated blood. After removing the brain from the cranium the ball dropped from its lodgement in the anterior lobe. . . ."

The last sentence of this version may explain why there was a discrepancy as to where the bullet lodged; it fell out after the brain was removed, perhaps before the doctors could get an accurate view of its location. It is odd that Taft describes the track of the ball as "plainly indicated," since Woodward obviously had an entirely

different view. Both versions do agree that the two orbital plates were fractured, an occurrence common in gunshot wounds to the head.

The procedures used to treat Lincoln were obviously very different from what would have been done today. From the start his doctors were probably doing more harm than good. Dr. Leale's comment about first inserting his finger into the wound—"I believe that he would not have lived five minutes longer if the pressure on the brain had not been relieved and if he had been left that much longer in the sitting posture"—reveals a total misunderstanding of the pathophysiology of brain trauma. Although intracranial pressure may have been high, the sort of probe Leale delivered could have easily ruptured blood vessels that had not been hit by the ball. The blood that "oozed out" almost certainly resulted from fresh bleeding. After this type of low-velocity missile enters the brain, the tissue behind the ball will swell, closing up the track of the ball. A probe of this sort will therefore cause an *increase* in intracranial pressure, adjusting to the sudden increase in volume. When the finger is removed, whatever oozes out has been caused by a broken clot or perhaps a broken blood vessel.

When Lincoln's doctors again entered the wound with a porcelain Nelaton's probe to locate the ball, the surgeon general encountered a foreign object about two and a half inches down the track that was "easily passed" until the tip of the probe came in contact with the ball itself. More damage could easily have been incurred here. Furthermore, it was not necessary to remove the missile. Today the ball would have been left alone, unless it was easily accessible.

THE QUESTION IS, HOW MANY OF these hazards were known in 1865? Surgical case records at New York Hospital from the early 1860s describe treatments of injuries of an invasive nature similar to Lincoln's. In most of these cases the doctors did very little for the patients. On December 4, 1862, a man was wounded by a buckshot "which entered outside of the left orbit exterior to globe of eye, and passing, backwards, downwards and outwards, lodged probably in the neighborhood of the mastoid portion of the temporal bone." The doctor made an opening behind and a little below the ear and, at a depth of three-quarters of an inch, reached the abscess and evacuated the contents. A few small pieces of bone were felt but could not be removed. Little else was done, and in less than a month the patient healed and was discharged. Another patient was wounded by a ball that entered near his right eye. The direction of the ball was backward and a little downward. "On passing a probe, it goes in about two inches but cannot detect the ball." After three more weeks in the hospital, the patient was discharged while the ball was never found. The doctor's only treatment was to "order a poultice."

There were several other incidents of gunshot wounds to the brain from the case histories dated 1859–1862. In fact, most of these wounds were found to be nonfatal—largely the result of the low-kinetic-energy missiles that were in use. The New York Hospital Archives reveal only one head wound admitted during the Civil War that underwent "passing a probe."

In none of these cases did the doctors report using their fingers or any other device to "relieve the pressure" on the brain. In fact, there were many doctors who explicitly warned against the practices that were administered to Lincoln. When Leale first probed Lincoln's wound with his unsterile finger, he was inviting sepsis, and had the President lived long enough, his wound would have become infected. Then, as now, infection was an issue. Around 1860 the discoverer of chloroform anesthesia, Sir James Y. Simpson, issued a survey to surgeons and found that of 2,098 amputations in hospital practice, 855 (40 percent) died, while only 226, or 10 percent, of the same number of patients died from amputations performed outside hospitals. Simpson concluded that "a man laid on the operating table in one of our surgical hospitals is exposed to more chances of death than was the English soldier on the battle of Waterloo." During the Civil War 110,000 Union soldiers died from wounds or were killed in action, while 224,000 died from disease; the figures for Confederates were roughly proportionate.

IT WAS CLEAR TO ALMOST EVERYone that something was flagrantly wrong with the hospitals and medical practices of the time. Ignaz Semmelweis, a Hungarian doctor working in Viennese maternity wards, attempted to address the problem. Everyone knew about the high incidences of fatal puerperal fever among postpartum women in maternity wards and that the lying-in wards attended by medical students and doctors had higher fatality rates than those attended by nurses.

Semmelweis observed that the doctors came straight from dissecting tables to these wards, and around 1846 he began to insist that all who came from the dissecting rooms wash their hands in chlorinated lime. Incidences of puerperal fever fell dramatically.

Most doctors did not heed Semmelweis's warnings, but there were medical men in this country who supported his assertions. Oliver Wendell Holmes in fact had already published an article advising physicians to wash their hands in calcium chloride after attending women with puerperal fever. At around the same time, Louis Pasteur, studying fermentation, had discovered that it could not take place without germs. Eventually he drew the first clear analogy between fermentation and septicemia. But Pasteur was not a doctor, and his principles were not applied to medicine and surgery until Dr. Joseph Lister read them and formulated a technique for performing antiseptic surgery.

The importance of antiseptic measures had been realized by many doctors by the time of Lincoln's assassination. Still, this was a minor concern and not a contributing factor in Lincoln's demise. Tissue damage incurred by the probe was likely much more

harmful, and it, too, was an imprudent procedure given the standards of the time. Some doctors had known this as early as the 1820s. Dominique Jean Larrey, the surgeon-in-chief of the imperial armies of France under Napoleon, was emphatically opposed to this type of probe: "And I repeat this," he wrote, "if foreign bodies pass beyond the inner table of the skull into the substance of the brain, it is better to leave the patient to the results of expectant treatment than to attempt to explore the interior of this pulpy organ, as we have seen some practitioners do."

John K. Lattimer, the author of the 1980 study *Kennedy and Lincoln: Medical and Ballistic Comparisons of Their Assassinations*, wrote extensively on the topic of Lincoln's murder, and his is the most detailed account of the President's medical treatment. There are several points in Lattimer's book that I would question. Most important, he asserts that "there seems to be no reason to disagree with those who have stated that Lincoln could not possibly have survived this wound, even in modern times. . . ." He argues that "the principles of aseptic techniques and the concept of germs as the cause of wound infections were unknown in Lincoln's day; while occasional Civil War soldiers were reported to have recovered from bullet wounds of the brain, these were rare exceptions."

As we have seen, the role of germs in wound infections certainly was known in Lincoln's day. Lister did not publish his first papers until two years after the President's assassination, but his theories on the spread of infection by germs had been established two decades earlier. As for Lattimer's other assertion, research indicates that during the Civil War many soldiers as well as civilians *did* survive gunshot wounds to the brain. Among the cases I reviewed at New York Hospital, more patients survived these wounds than did not!

Another point Lattimer uses to support his case is that the autopsy "does not take into account the further damage which is now known to result from the momentary creation of a large cavity in the brain when it is traversed by a missile traveling at the speed of a bullet." This is true for many of today's high-velocity bullets but not of the slow-moving lead ball that killed Lincoln. Evidence for the derringer's extremely low muzzle velocity is shown in that the ball "lodged in the white matter of the cerebrum," a fact uncontested in all of Lincoln's autopsy reports; the brain's gelatinous consistency can impede only the very slowest missiles. The ball's kinetic energy would have been too low to form much, if any, of a cavity.

> THE DAMAGE done by the ball was significant but not devastating; many people have survived greater wounds.

With all the speculation as to the correct path of the ball, I assert that regardless of whether it lodged above the right or left orbit, Lincoln's wound was not necessarily fatal. There are two errors in Lattimer's comment that "it is surprising that, if the bullet had indeed traversed the central part of the brain [stem] damaging it directly as it would if it crossed the midline, respirations could be maintained at all." First, if the bullet had damaged the brainstem directly, it would have been impossible for Lincoln to have lasted nine hours; he would have died instantly. Second, if the ball crossed the midline of the brain, it didn't traverse the brain stem. If the ball entered just above the left lateral sinus (a fact uncontested in Woodward's autopsy report) and traveled across the brain to lodge above the right orbit, it would have passed above the brainstem.

It would, of course, be unfair to hold Lincoln's doctors completely responsible for his death. It was at the time very difficult to understand the extent of this type of injury and devise a procedure to treat it. Although excessive probing did probably have a negative effect on the President's condition, there was still the problem of raised intracranial pressure, for which there was no known treatment in 1865.

Nevertheless, there were doctors in Lincoln's day who knew better. If the principles of Larrey and others had been heeded, the doctors would never have probed as they did. There are reasons to believe that today Lincoln's life could have been saved. The damage incurred by the ball was significant but not devastating, and many people have survived wounds of a greater force.

When defending the constitutionality of the Emancipation Proclamation, Lincoln used a metaphor that is both ironic and relevant to this article: "Often a limb must be amputated to save a life. The surgeon is solemnly bound to try to save both life *and* limb; but when the crisis comes, and the limb must be sacrificed as the only chance of saving the life, no honest man will hesitate. . . . In our case, the moment came when I felt that slavery must die that the nation might live."

In the days before antiseptic surgery, Lincoln had foreshadowed his own demise; his efforts to preserve the life of the nation had been successful at the cost of its strongest limb. ★

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Lincoln's Last Legacy: A Narrative of the President's Obscured Autopsy Instruments

Leslie L. Alexander, MD, and Nora M.L. Atkins, RN

Brooklyn, New York

One hundred thirty-three years ago, Confederate Gen Robert E. Lee surrendered to Union Gen Ulysses S. Grant at Appomattox, Virginia, ending the 4-year civil conflict in which nearly 2.5 million soldiers served and some 600,000 soldiers died. Although there had been rumors in some circles of a plot to overthrow the government,[1] the nation's capital generally was near-euphoric; parties and celebrations were held throughout the country. Secretary of the Navy Gideon Welles had commissioned portraitist Matthew Wilson to paint President Lincoln on February 5, 1865 (Figure 1). The festivities office of the president duly announced that the President would attend the play, "Our America Cousin," at Fords Theater on April 14th. That same evening, Abraham Lincoln was mortally wounded by a gunshot wound to the head. It was barely 5 days after the surrender at Appomattox.

After Lincoln had been shot, several physicians responded quickly to the call for a doctor. They placed Lincoln flat on the floor and then carried him to a house across the street from Ford Theater using a door as a stretcher. There, he was placed crosswise on a bed too short for his stature. Poultices were applied to the anterior surface of his body and artificial heat to his extremities. A sip of diluted brandy also was administered. Probing for the bullet was unsuccessful. The remainder of care consisted of monitoring Lincoln's pulse, respiration, and pupils.[2]

Figure 1.
Painting of President Abraham Lincoln that was completed 2 days before his assassination. (Courtesy of the Louis A. Warren Lincoln Library and Museum, Fort Wayne, Indiana.)

Eighteen physicians participated in Lincoln's care and secret autopsy (Table). The necropsy findings confirmed the clinical impression that the bullet entered the left side of the occipital bone and traveled obliquely and anteriorly to lodge in the right anterior cerebrum behind the right orbital plate. The autopsy report was written on a prescription pad (Figure 2) by Dr Robert Stone, the president's family physician. A probe, cranial fragments, and bullet (Figure 3) as well as hair, scalp, and brain tissue removed during the autopsy are housed at the Armed Forces Institute of Pathology in Washington.

While little is generally known about the hurried, secret autopsy of President Lincoln 133 years ago, even less is known about the instruments used to perform that autopsy. These instruments can be described as a surgeon's portable operative kit (Figure 4). The instruments, which are made of steel, are in excellent condition. The velvet-lined

Presented at the 100th Annual Convention ond Scientific Assembly af the Natianol Medicol Associotion, July 29-August 3, 1995, Atlonta, Geargio. Dr Alexander is Radialagy Consultant at Queens Haspital Medicol Center, New Hyde Pork, New Yark ond Ms Atkins is a retired United Stotes Public Heolth Service registered nurse. Requests far reprints should be oddressed to Dr Leslie L. Alexander, 1492 President St, Brooklyn, NY 11213-4543.

Table. Physicians and Surgeons at Lincoln's Autopsy*†

Participant	Age in 1865	Title	Medical School	Year of Graduation
Charles Augustus Leale (1842-1932)	23	US Assistant Surgeon	Bellevue	1865
Charles Sabin Taft (1842-1889)	23	US Assistant Surgeon	Bellevue	1865
Charles Mason Ford (1840-1884)	25	US Assistant Surgeon	Pennsylvania	1861
Albert Freeman Africanus King (1841-1914)	23	US Assistant Surgeon	Columbia	1865
Charles D. Gatch	?	?	?	
Ezra W. Abbott (1840-1906)	25?	?	?	
D. Willard Bliss (1825-1889)	40	Colonel, Medical Corps	Western Reserve	1845
Joseph K. Barnes (1817-1883)	48	US Surgeon General	Pennsylvania	1838
Charles Henry Crane (1825-1883)	40	US Assistant Surgeon General	Harvard	1847
Robert King Stone (1822-1872)	43	Family doctor	Pennsylvania	1845
Lyman Beecher Todd (1832-1902)	33	Civilian	Jefferson	1854
Charles H.L. Lieberman (1813-1886)	52	Civilian	Berlin	1838
John Frederick May (1812-1891)	53	Civilian	Columbia	1834
James Crowell Hall (1805-1880)	60	Civilian	Pennsylvania	1827
Joseph Janvier Woodward (1833-1884)	32	US Assistant Surgeon	Pennsylvania	1853
Edward Curtis (1838-1912)	26	US Assistant Surgeon (Pathologist)	Pennsylvania	1864
William Morrison Notson (circa 1842-1882)	23?	US Assistant Surgeon	Jefferson	1861
George Alexander Otis (1830-1881)	35	US Assistant Surgeon (Curator, Army Medical Museum)	Pennsylvania	

*Courtesy of the Surgeon General, United States Army, Washington, DC.
†Listed in order of participation.

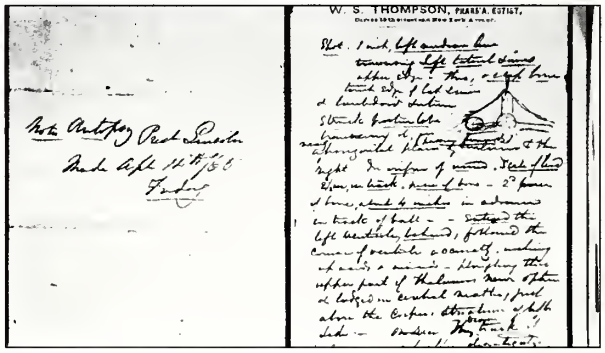

Figure 2.
President Abraham Lincoln's autopsy report. (Courtesy of the Surgeon General, United States Army, Washington, DC.)

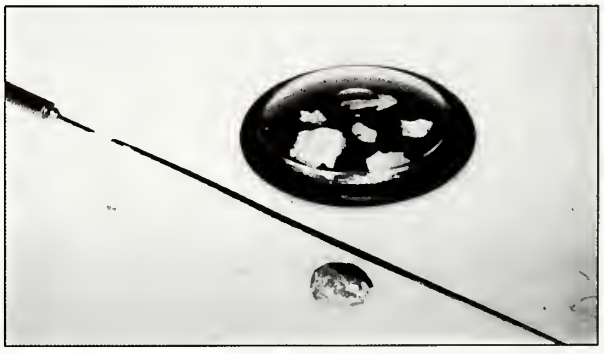

Figure 3.
Bone fragments and bullet removed from President Lincoln's brain. (Courtesy of Armed Forces Institute of Pathology, Washington, DC.)

mahogany cabinet contains three compartments and weighs 4 lb. Spaces for 26 instruments contain 12 scalpels, 3 probes, 2 refractors, bone shears and a saw, bone forceps, a bullet probe, and a pocket magnifying glass. Only the original scissors and a tissue clamp are missing from the center compartment.

On one instrument, a pair of bone forceps, the name H.G. Kern is imprinted.[3] Another pair of bone forceps is imprinted with "Lentz, Phila," and a

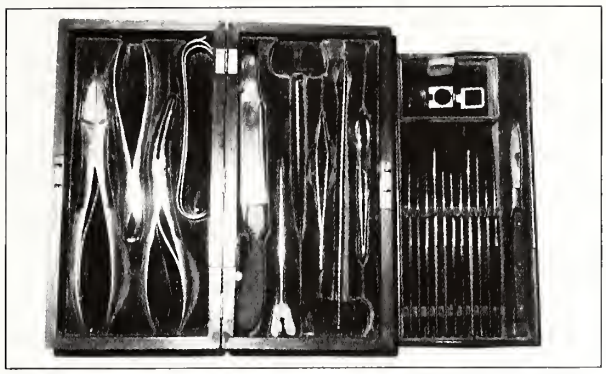

Figure 4.
The original surgical instruments used during President Abraham Lincoln's autopsy.

Figure 6.
Presentation of Lincoln autopsy instruments by members of the Kings County Medical Society.

Figure 5.
Dr Ezra H. Wilson, chief bacteriologist of the Board of Health of the old City of Brooklyn, New York, and head of the bacteriological department at the Hoagland Laboratory of the Long Island College Hospital.

Figure 7.
Dr William Morrison Notson, the presumed original owner of the instruments used during Lincoln's autopsy. (Courtesy of the Surgeon General, United States Army, Washington, DC.)

scalpel is marked "Lentz." Both instrument makers were well-known Philadelphia firms, and H.G. Kern was located on North Sixth St, near Jefferson Medical College.

The story of how these original autopsy instruments found their way to Brooklyn, New York, is a long and circuitous one. Major Alfred D. Wilson was a surgeon in the Third Regiment of the New York Volunteer Artillery. The field and staff muster roll of March and April 1865 shows that he was on detached service at Foster General Hospital in New Bern, North Carolina. After 16 months of service in New Bern, he applied for a 30-day vacation in August 1864 because of hardship; this vacation was granted.

At the time of Lincoln's death, Major Wilson was in Washington. While Major Wilson was not present at the autopsy itself, he served as a door guard and attendant in helping to maintain the secrecy of the president's autopsy. Only family, high government officials, local physicians, and Army personnel were permitted entrance. When no one claimed the autopsy kit upon completion of the procedure, Major Wilson requested it and was granted his wish by the autopsy surgeon. On the death of Major Wilson in 1875, the historic case went to his nephew, Dr Ezra Herbert Wilson (Figure 5), who, like his uncle, was a resident of Long Island.

Dr Wilson kept the autopsy case in a locked cabinet in the library of the Hoagland Laboratory until his death in 1905. His successor at Hoagland Laboratory, Dr Archibald Murray, along with Dr William Browning, Librarian of the Medical Society of the County of Kings, agreed to continue its secrecy therein until the history of the case and instruments could be prepared.[4] Meanwhile, Dr Ezra Wilson's sister, Caroline Wilson Kelley, officially deeded the autopsy set on October 28, 1934, to Dr Browning for presentation to the Medical Society of the County of Kings and the Academy of Medicine of Brooklyn. At the Society's meeting on May 20, 1935, Dr Browning presented the set to the Society's Collection of Medical Memorabilia (*Brooklyn Daily Eagle.* May 22, 1935:36).[4]

In 1983, the Lincoln autopsy instruments were presented to the National Museum of American History (Figure 6) and were displayed in the Illinois State Exhibit devoted to artifacts of Lincoln. The accompanying plaque read:

> Case of medical instruments used at the autopsy on April 15, 1865 on the body of President Abraham Lincoln, following his assassination. Recently donated to this exhibit by the Medical Society of the County of Kings and the Academy of Medicine of Brooklyn, Inc.[5]

Who actually owned the original Lincoln autopsy instruments has not been verified. It is known that these instruments were manufactured in Philadelphia sometime during 1861 and 1865. A review of the autopsy participants in the Table reveals that Army Assistant Surgeon William Morrison Notson (Figure 7) completed his medical training at Jefferson Medical College in 1861. He presumably could have been the owner of the autopsy set. In as much as no one claimed this set upon the completion of the autopsy, and the fact that because of a rumor that Secretary of State William H. Seward had been killed in a conspiracy to overthrow the government, Surgeon General Joseph K. Barnes interrupted Dr Notson's participation in Lincoln's autopsy so that he could attend to Seward. This may account for the unclaimed instruments when Lincoln's autopsy was done.

Throughout America and the world, there are hundreds of thousands of biographies, newspaper and magazine articles, manuscripts, photographs, busts, plaques, medals, flags, and other artifacts that commemorate President Lincoln's life, legacy, and legend. After 133 years, it is the earnest hope that these final medical mementos also will contribute to the lore of Lincoln memorabilia.

ACKNOWLEDGMENTS

The authors thank the director and staff of the Louis A. Warren Lincoln Library and Museum, Fort Wayne, Indiana, for their consultation and cooperation, and Mrs Rose Jones, the managing editor of the *Bulletin of the Medical Society of the County of Kings* and the *Academy of Medicine of Brooklyn, Inc*, for her encouragement and assistance.

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Page Title:President Abraham Lincoln
Page URL: http://www.umm.edu/news/releases/abraham_lincoln.htm

FOR IMMEDIATE RELEASE: MAY 18, 2007
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COULD MODERN TRAUMA CARE HAVE SAVED ABRAHAM LINCOLN?

University of Maryland School of Medicine and the VA Maryland Health Care System Sponsor Conference on Whether Today's Medical Treatment Could Have Altered History

Could President Abraham Lincoln survive a gunshot wound from an assassin's bullet if it had occurred in 2007 instead of 1865, due to modern advances in trauma care? If so, what would have been the impact on history?

Those questions are the focus of the 13th annual Historical Clinicopathological Conference (CPC) sponsored by the University of Maryland School of Medicine and the Veterans Affairs (VA) Maryland Health Care System in Baltimore. This annual conference is devoted to the modern medical diagnosis of disorders that affected prominent historical figures.

The 2007 Historical CPC will be held Friday, May 18, from 1:30 to 3:00 p.m., in Davidge Hall (522 W. Lombard Street) at the University of Maryland School of Medicine in Baltimore. More than 300 alumni, faculty members, students and local history buffs are expected to attend this event, which is also part of the School of Medicine's bicentennial.

President Lincoln sustained a massive head wound after the bullet from John Wilkes Booth's derringer entered the back of his head and stopped just behind his left eye, destroying the left side of the brain in the process.

At the conference, Thomas M. Scalea, M.D., physician-in-chief at the R Adams Cowley Shock Trauma Center at the University of Maryland Medical Center and director of the Program in Trauma at the University of Maryland School of Medicine, will explain how Lincoln would be treated at Shock Trauma, home of the world's first dedicated trauma center, which opened in 1968.

"There is little question that President Lincoln would have been disabled," says Dr. Scalea. "However, I believe if he had been brought to the Shock Trauma Center in 2007, his survival, while not guaranteed, would have been a very reasonable expectation."

Dr. Scalea says modern emergency medical care would involve rapid transport to a qualified trauma center, may have included airway management in the field, and would certainly have involved fluids and other supportive measures.

Immediately upon arrival at Shock Trauma, sophisticated technology such as a CT scan would be used

to image the wound and doctors would give medications to reduce the effects of brain swelling. Lincoln also would have undergone a surgical procedure to remove accumulated blood and reduce pressure on his brain. While nothing could undo the bullet's damage, Dr. Scalea says efforts could be directed to prevent further damage, known as secondary brain injury. He adds that advanced respiratory care, early nutrition and frequent re-imaging would all be utilized. Monitoring to measure brain pressure and/or cerebral blood flow might also be helpful.

But beyond survival, would Lincoln have been able to communicate, relate to his environment or make meaningful decisions? Dr. Scalea observes that the frontal lobes of Lincoln's brain were spared. Since these lobes are home to language, emotions and problem-solving, he says Lincoln's cognitive abilities would have remained intact. "The issue would have been his ability to express his ideas because of severe damage to other parts of the brain," says Dr. Scalea. He says that with modern rehabilitation, unavailable in the 1860's, Lincoln may have been able to communicate. "We have all seen people make a seemingly miraculous recovery," he says. But he cautions, "Brain injury is very hard to predict."

Lincoln died within 10 hours of being shot on April 14, 1865. U.S. presidential historian Steven Lee Carson will explore the question of whether there would have been chaos if Lincoln had lived. Carson is a lecturer, author, playwright, and editor as well as a commentator for radio and television who has spoken at the White House and the Kremlin.

He points out that the Constitution had no provision for presidential disability or incapacity in 1865. The 25th Amendment, proposed by the 89th Congress 100 years later and ratified in 1967, describes the process by which the president is declared unable to discharge the powers and duties of office and how the vice president becomes acting president.

Carson says Edwin M. Stanton, Lincoln's Secretary of War, took over the government for about 24 hours because there was initial concern that there might be an attempt to assassinate Vice President Andrew Johnson as well. These fears were fueled, in part, after Secretary of State William H. Seward and his family were attacked in their home on Lafayette Square across from the White House on the same night Lincoln was shot. A Booth accomplice was indeed assigned to assassinate the vice president, but got drunk instead. The man was later hanged with the other conspirators. Johnson was sworn in as president.

"Were it not for Stanton, there would have been much more chaos," says Carson, "especially with a highly distraught Mrs. Lincoln on the scene."

The historian will highlight some of Lincoln's accomplishments beyond his efforts to save the Union and how he used humor to overcome his own depression.

Carson will also amplify the theme of problems associated with presidential succession by looking at the two longest periods during which a president was disabled: the two months President James Garfield survived after being shot and the longest presidential disability, the period from October 2, 1919, when President Woodrow Wilson suffered a massive stroke until March 4, 1921, the natural end of his term, when Warren G. Harding took over.

Carson will compare Mary Todd Lincoln to Wilson's wife, Edith Bolling Galt Wilson, and how each reacted to her husband's situation and the issue of who should run the country in the absence of a constitutional provision.

Also during the conference, local historian Wayne Millan will portray Dr. Samuel Mudd, a graduate of the University of Maryland School of Medicine, who tended to Booth's broken leg after the shooting and was convicted and imprisoned as an accomplice in the Lincoln murder conspiracy. Andrew Johnson eventually pardoned Mudd, but during the conference, the Mudd character will appeal to his colleagues for exoneration, an action he sought during his lifetime that would have cleared him of the original charges.

The Lincoln case is a departure from past conferences, when the name of the famous person whose death was being analyzed was kept secret until the end. In Lincoln's case, the details of his assassination are so well known, organizers decided to reveal his name in advance.

Philip A. Mackowiak, M.D., professor and vice chair of the Department of Medicine at the University of Maryland School of Medicine and director of medical care at the VA Maryland Health Care System, created the Historical CPC. He has authored a new book, *Post Mortem: Solving History's Great Medical Mysteries* (American College of Physicians, 2007), which re-examines 12 of the cases that have been presented at these Historical CPCs. "The book offers new thoughts on the causes of these illnesses and some new diagnoses that differ from CPC diagnoses," says Dr. Mackowiak. It is available in book stores, or from the publisher at http://www.acponline.org/postmortem.

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This page was last updated on: May 18, 2007.

The Washington Post

Could Modern Medicine Have Saved Lincoln?

By David Brown
Washington Post Staff Writer
Monday, May 21, 2007

If Ford's Theatre had been in Baltimore, if the patient had been taken to the state Shock Trauma Center and if 1865 were 2007 . . . Abraham Lincoln might have survived the gunshot wound to his head.

If he had lived, he would at the very least have been partially blind, unsteady on his feet, numb in certain regions of his body and inarticulate. Nevertheless, he might have been able to think and, after much rehabilitation, communicate.

What that might have meant to the United States at the dawn of reunification after the Civil War -- well, the string of imaginary events can be unspooled forever.

In their annual examination with the flexible retrospectoscope, medical experts last week took on the case of Abraham Lincoln at the 13th Historical Clinicopathological Conference, sponsored by the University of Maryland School of Medicine and the Veterans Affairs hospital.

Previous exercises have sought to diagnose illness or determine cause of death of famous people with incomplete medical records. They include Alexander the Great (typhoid fever complicated by Guillain-Barre syndrome), Ludwig van Beethoven (syphilis) and Edgar Allan Poe (rabies, a diagnosis now generally discredited). This year's attempted not to solve a mystery but rather to address an extreme hypothetical -- what might have happened to one of the country's greatest presidents if time travel were possible.

"We probably see a dozen gunshot wounds to the head each year where people survive. He had a non-fatal injury by 2007 standards," said Thomas M. Scalea, a surgeon and the director of the Shock Trauma Center.

Though almost all previous analyses have called Lincoln's wound unsurvivable under any circumstance, Scalea believes evidence to the contrary is in plain view. Lincoln survived for nine hours.

Lincoln was shot about 10:25 p.m. on April 14, 1865. He lived long past the "golden hour" when stabilization of vital functions -- principally, respiration and blood pressure -- is essential. Throughout the night his condition waxed and waned, until brain swelling and blood loss tipped him inevitably toward death, which occurred at 7:22 a.m. the next day.

During that night, which ended with Secretary of War Edwin Stanton's memorable comment "Now he belongs to the ages," definitive medical care would have been possible if Lincoln had lived in another

age.

"For him to have lived today would not be an extraordinary thing," Scalea said.

John Wilkes Booth, the assassin, shot the 16th president with a muzzle-loading derringer pistol. The bullet -- apparently a .41-caliber slug fired from the .44-caliber weapon -- pierced the lower rear part of the skull, called the occipital bone, and traveled roughly straight forward.

It tore a path through the left side of the brain, including through the fluid-filled lateral ventricle. But it did not hit the brainstem, which controls such essential functions as breathing, did not cross the midline, and stopped before entering the frontal lobes, the seat of reason and emotional control.

What is more extraordinary than what might have happened to Lincoln if he were treated in the 21st century is what *did* happen to him in the middle of the 19th.

Lincoln received a version of cardiopulmonary resuscitation that is eerily similar to what is standard today. His medical care -- first in the theater, then at a boardinghouse across the street -- focused largely on brain decompression, one of the chief therapeutic goals in modern treatment of head trauma.

The first physician to attend Lincoln was Charles Augustus Leale, a 23-year-old Army surgeon sitting 40 feet from the presidential box, assigned to attend the performance in case of a threat to the president's health.

CPR protocol calls for an "ABC" assessment of the patient -- airway, breathing, circulation. Leale reported that when he arrived, Lincoln's breathing "was intermittently and exceedingly stertorous" (snore-like). He could feel no pulse in the president's wrist. He explored the head wound, probing it with a pinkie finger and dislodging a clot -- after which Lincoln's breathing "became more regular."

Over the next 20 minutes, with the help of two other physicians, Leale resuscitated Lincoln.

They placed him on his back. Leale straddled him on his knees, opened Lincoln's mouth, depressed the tongue "and made a free passage for air to enter the lungs." They manipulated his arms in a version of artificial respiration. At one point Leale "forcibly breathed directly into his mouth and nostrils . . . and improved his respirations."

Incredibly, at one point Leale applied "intermittent sliding pressure under and beneath the ribs" and "stimulated the apex of the heart." That was an early form of "external cardiac massage," although its purpose was not to circulate blood directly but to spur the heart to do so.

Once Lincoln moved to his deathbed (which he fit in only diagonally because of his height), his pulse and breathing periodically slowed, a consequence of bleeding and swelling of the brain.

High "intracerebral pressure" causes an automatic slowing of the heartbeat called the Cushing reflex, named after the 20th-century neurosurgeon Harvey Cushing. It also pushes the brainstem, which controls respiration, against the hole at the base of the skull where the spinal cord connects to the brain. Lincoln's dilated left pupil, noted by Leale in the theater, was also evidence of this threatened "brainstem herniation."

The doctors relieved the pressure by taking clots out of the wound and probing it with a metal

instrument. But those temporizing measures eventually failed.

Today, paramedics would "scoop and run" with Lincoln. Studies have shown that almost nothing done in the field, other than driving fast, increases survival of victims of head trauma. Doctors would put a breathing tube down his trachea as soon as he arrived at the hospital. He would be given intravenous fluid that is far saltier than blood, which would slightly shrink his brain, relieving pressure. He would get a quick physical exam and a CAT scan of his head -- all in 10 minutes.

In Lincoln's case, the images would have revealed large pools of blood that surgeons could have taken out. They would probably remove much of one side of the skull and leave it open but covered. The piece of bone would be "banked" for replacement if he survived.

If that was not enough, surgeons could try other maneuvers. Two used at the Shock Trauma Center, and largely developed there, are opening the abdominal cavity -- which, curiously, lowers intracerebral pressure -- and standing the unconscious patient's bed vertical, which enlists gravity to the task.

In the intensive-care unit, a modern Lincoln would face myriad hazards, including infection, kidney failure and uncontrolled bleeding. If he survived them, the Everest of rehabilitation would lie ahead.

But people do make it, Scalea said. About one a month, in Baltimore.